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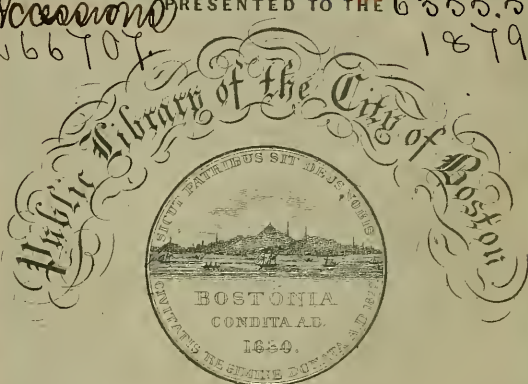
Third Annual Report
OF THE
BOSTON WATER BOARD.



1879.

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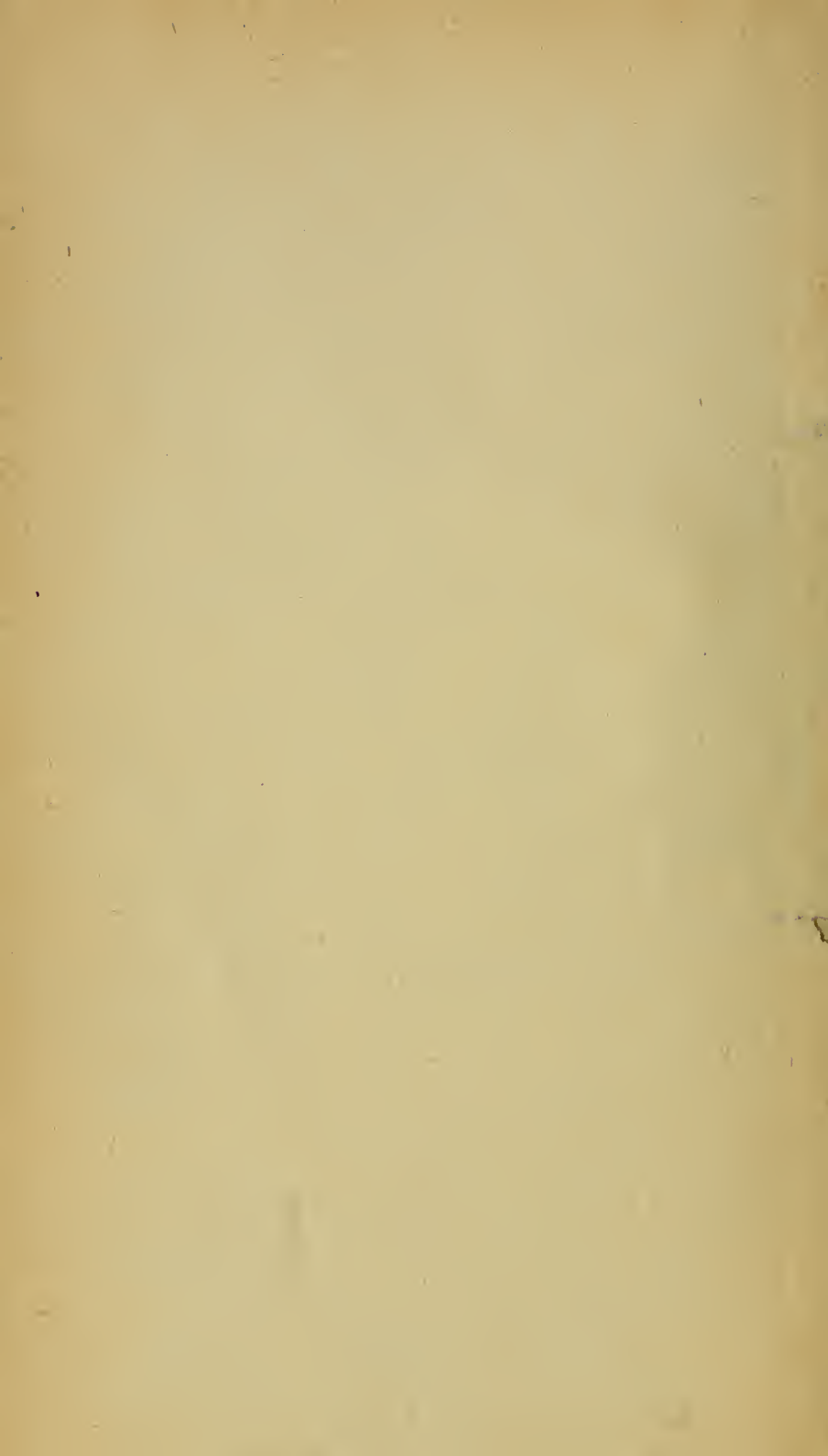
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THIRD ANNUAL REPORT

OF THE

BOSTON WATER BOARD,

FOR THE

YEAR ENDING APRIL 30, 1879.



BOSTON:
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1879.

CITY OF



BOSTON.

THIRD ANNUAL REPORT

OF THE

BOSTON WATER BOARD,

FOR THE YEAR ENDING APRIL 30, 1879.

OFFICE OF THE BOSTON WATER BOARD,

May 1, 1879.

To the City Council of the City of Boston:—

The Boston Water Board respectfully submit their third annual report, and transmit to the City Council reports from the City Engineer and the Water Registrar, as required by the ordinance establishing the Board. They also present reports from the Clerk of the Board, from the Clerk and Registrar of the Mystic Department, from the Superintendents of Eastern and Western Divisions of the Cochituate, and the Superintendent of the Mystic Water Works.

The Board have still to say, that it has consumed a great deal of time, and required almost constant thought, to look after, and properly investigate the numerous claims for damages occasioned by the action of the city in providing an additional supply of pure water; and they feel justified in remarking that this has been a service, the difficulties of which can hardly be appreciated except by those who have had similar work to do. They hope and believe that they have been reasonably successful, in rendering a full equiva-

lent to individuals for all interference with their rights and property which a great public necessity made necessary, at the same time that they have protected the interests of the city, and saved its treasury many times from the payment of exorbitant and improper demands. The whole number of claims settled up to May 1, 1879, is 204. The amount paid for land and water damages to same date, \$930,527.23.

In former reports of the Board the Council were informed that changes were gradually being made in the business of the Water Department, which seemed to be desirable and necessary; and that, notwithstanding the greater part of the time of the Board was devoted to the new supply works, and the questions and settlements connected therewith, steady progress in this direction was being made. They now add their belief that these changes are making the department more effective and less expensive.

The Board was organized on the 1st day of August, 1876, and early in the year 1877 the powers given them in the ordinance were changed and limited by a special order of the City Council, known as the retrenchment order. The sum authorized to be expended for clerk-hire was fixed; for a while the employment of labor was restricted, except as authorized by the Committee on Water; and the report of the Committee on Retrenchment, which was accepted by the City Council, promised later on in the season another report on the question of still further reducing the number of employés, and on the consolidation or abolishment of some of the departments. Under these circumstances, in making their first annual report, May 1877, the Board could only indicate what were their intentions in relation to a reorganization, and especially in relation to a new system of book-keeping, which they early concluded was necessary; and, after referring to the retrenchment order as interfering with their plans, they added that they could only be matured and presented at some future time for the consideration of the Council.

Early in February, 1878, they sent a communication to the Council, asking for authority to employ an expert accountant, and an order was passed soon after, granting such authority, and appropriating \$500 to be used for the purpose. An expert was at once employed, and a system of book-keeping adopted which is now in use, and which, it is believed, is a marked improvement upon the one it superseded.

The adoption of a new system of keeping accounts brought up an old question, which had been many times discussed by former Water Boards, and which was of great

interest to this Board on account of its bearing upon another question, to wit, a change in the tariff of water rates. The question was, Shall the income of the Water Department be used in payment of the city debt, other than the outstanding water loan, or water scrip?

For many years, beginning with 1858, the City Auditor, in making up his estimates of the amount which would be required to carry on the government for the year, had deducted from the sum of the interest on the general city debt, an amount which would cover the interest on the difference between the whole amount expended by the city for the Cochituate Water Works, and the amount of the outstanding water loan; presuming that the Council would direct so much of the interest on the general debt to be taken from the income of the Cochituate Water Works; the theory being, that so much of the general city debt had been incurred for the benefit of the water works, and was due from the Water Department to the Treasury. These estimates of the Auditor had each year been referred by the Council to a joint special committee, who had adopted his policy, and made reports in accordance therewith, which reports had been accepted by the City Council, and orders passed directing the manner in which the income of the water works should be used.

In 1877 the joint special committee on the Auditor's estimates, of which the present Mayor was chairman, having, as they said, fully considered the matter, recommended that "all the expenditures for carrying on, maintaining, and extending the Cochituate Water Works, with the interest on the Cochituate Water Loans and the cost of the works, and premium and exchange with which a part of said interest is paid, be defrayed from the revenue received from said works." — [See City Document, No. 40, 1877, pages 6 and 7.] Previous to this time the form of report had been different. Special appropriations for the water works and water interest had been made, and authority given in the order levying a tax for the year, to use the income of the works, as estimated, by the Auditor, in payment of interest.

It had seemed to this Board at least questionable whether the income of the water works could rightfully be used to pay interest on a sum assumed to be due from the water works to the Treasury Department, or whether any water debt existed except the outstanding water scrip; and inasmuch as the income, if so used, would leave the surplus too small to admit of a reduction of the water rates, — a very desirable thing to be accomplished if possible, — they had repeatedly objected to such use, and had pressed their

opinion on the subject quite as far as propriety or a decent respect to the judgment of other city officials, and the City Council, would warrant.

Late in 1876 the Joint Standing Committee on Water made a report on the petition of the Standard Sugar Refinery, and others, for a reduction in the price of water furnished through meters, recommending a reference of the matter to this Board, with the request that a reduction not exceeding one cent per one hundred gallons be made in the price of metered water, after April 1, 1877. The committee had given the petitioners a public hearing, which was very fully attended, and the reasons given by the petitioners for claiming a reduction were such as could only be answered by a statement that the water supply would not be equal to the increased consumption, or that the reduced income would be insufficient to meet the requirements of the statute. The first of these objections could be overcome by the early completion of the Sudbury-river conduit, and the last only by a change in the policy of using a portion of the income of the Cochituate Water Works, for the payment of a portion of the interest on the general city debt. The Board had no doubt as to the sufficiency of the supply of water; but, as it was evident that the income of the works would again be required by the Council to contribute towards the interest on the city debt, their only course was to figure upon that basis, and a reduction of one-half cent per hundred gallons was all that could safely be made.

In the report of the Committee on Water this good reason was given for making a distinction in favor of those to whom water was furnished through meters, while no reduction was proposed in the price of water supplied for ordinary household and domestic purposes, viz.: the meter-takers were paying twenty-five per cent. of the entire yearly revenue, and using only $16\frac{2}{3}$ per cent. of the total consumption of water.

The Act of the Legislature, passed March 31, 1875, establishing the Boston Water Board, contains this provision: "Said Board may also establish and regulate the price or rents for the use of water, subject to the provisions of sections 12 and 13 of Chapter 167 of the Acts of 1846; and the words, 'Boston Water Scrip,' in said sections, shall be construed to include the whole amount of outstanding loans representing the cost of the water works." Immediately after the first organization of the Board, the old rates were established until otherwise ordered; and in the first report of the Board they say that careful comparisons and calculations will be necessary in determining what changes can and

ought to be made. They were soon convinced that a new tariff of water rates was much needed; and time has increased the evidence that complaints and murmurings over water bills, frequently made, are not always without reason. To prepare such a tariff two things are necessary: time to investigate, make comparisons and calculations, and the assurance that the condition of the income, rents, and receipts will be such as to warrant reduced prices, without violating the provisions of the statute referred to. With this duty pressing upon them, the Board, at the commencement of the present year, determined to make a strong effort to effect a change in the policy of using the income of the water works to pay interest on an assumed debt, and such arguments as they could use were brought to bear upon the Auditor in season to influence him in making up his annual estimates. On the 4th of January, before the present city government was organized, the following vote was passed:—

“Voted, That the Auditor of Accounts be requested to furnish the Board with a written statement, showing the amounts of interest transferred from City Interest to Cochituate Water Interest, in each year since the establishment of the Cochituate Water Works, and up to January 1, 1879; also the rate of interest and the amounts on which the interest was cast in each year.”

It will be needless to present the figures and statements which were afterwards prepared and made by the Board to show the effect of the former policy on the water accounts, for they found their way into the “Sunday Herald,” of February 23, 1879, and were used again in a communication from His Honor The Mayor to the City Council, on the 21st of April, 1879. The important point lies in the fact that on the 24th of January, 1879, the Auditor informed the Board that, after consultation with the Mayor and the City Solicitor, he had decided that a tax should be levied for all interest on the city debt over the amount which might be due on the water scrip, and that he should make his estimate accordingly. This decision seemed to be a warrant at least for a further reduction of the meter rates and the next day the following vote was passed by the Board:—

“Voted, That on and after the 1st day of April, 1879, the rate for metered water be fixed at two (2) cents per one hundred gallons, instead of two and one-half (2½) cents, as heretofore,”

— thus making good the promise in former reports, that such a reduction should be made, as soon as it could be done

in unquestioned compliance with the statute under which the water works were established.

Except for water supplied through meters, no alteration in the water rates can take effect until the commencement of another year, as the bills for the use of water are made out and payable in advance on the first day of January of each year; but, as before reported, it has been the study of the Board to know how to equalize and modify the present rates and regulations, and they have been preparing themselves for the work of making a new tariff, to be ready for use at the commencement of the next year. The Water Board who prepared the original tariff of rates, etc., say in their report: "We have devoted much attention to the maturing of the system of rates to be charged for the use of water upon a basis which shall favor its introduction for all purposes for which it can be advantageously used, at prices which, while they are just and reasonable, will be likely to insure the greatest amount of income to indemnify the city for the cost of the work." The condition of things is so different now, that to do the work proposed, in a judicious and satisfactory manner, will be a laborious and difficult task.

The communication sent to the Council by His Honor the Mayor, which has been referred to, gives the amounts taken each year since 1858, from the income of the Cochituate Water Works, to pay interest on city debt over and above the amount of interest due on the outstanding water scrip, and the opinion of City Solicitors Chandler and Healy as to the use which must be made under the act of 1846, with the net income, rents and receipts of the water works. It then says: "It is surprising that not only the Treasury should have claimed these large amounts without right, but that the Water Board should have surrendered its just dues without objection;" and adds immediately, "for the latter, recognizing the obligation of the statute touching the water income, drew the attention of the City Council to this unlawful diversion in their annual report of 1858, and again in their report for 1860." That this is correct, an examination of the reports referred to will clearly show; and that the Cochituate Water Board, up to the time of its ceasing to exist, held the same views and made the same objections, is said to be the case. It is certain that the Boston Water Board have always questioned the authority of the Council to use the income received from water rents to pay any other interest than that due on the outstanding water scrip, and their opinion has been fully understood by city officials having control of the matter.

It should be borne in mind that the revenue received by the Water Department is paid immediately into the City Treasury, and it is paid out only by the Treasurer, whose authority is limited by appropriations previously made by the City Council. The Water Board are authorized to incur expenditures, "provided that they shall not exceed, in the aggregate, the sums previously appropriated or authorized by the City Council for the care, maintenance, repair, and enlargement, of the Water Works" (see ordinance establishing the Boston Water Board); and all bills for expenditures by the Water Department, before they are paid by the Treasurer, must be drawn for by said Board, examined by the Auditor, and approved by the Committee on Accounts. The interest on the water-debt has been paid by the Treasurer without any action of the Water Board, and without notification or consultation with them. It is difficult therefore for the Board to understand what is meant by "surrendering their just dues without objection." It is plain that they cannot be justly charged with quietly endorsing the policy of using the income of the water-rents for the payment of an assumed indebtedness. On the contrary, they persevered in their objection until the Auditor, as he states in his explanation of his estimates for 1879-80 (City Document No. 27, 1879, page 4), "estimated the interest appropriation to meet the views of the Water Board," subject, of course, to the action of the City Council.

There is another matter referred to in the Mayor's communication, which it may do no harm to notice. It is said that the Water Board have not discriminated between what was properly chargeable to construction account, and what, in the words of the statute, should be regarded as the expenses and charges of distribution. It is singular that this statement should have been made immediately following another, in figures, taken from the reports of the Water Boards, commencing in 1858 and ending in 1878, of the amounts which each Board, during that period, had given to show the distinction they had made between construction and maintenance, and which aggregate \$1,394,827.88. It would seem as if the fact of discrimination, with the figures to prove it, had been adduced to show that there had been no discrimination. But it will be said, perhaps, that the question is, How have these amounts been paid? The answer is, In the only way provided,—out of the appropriations made for the purpose by the City Council.

The question whether the payment of the above sum,—\$1,394,827.88,—out of the income from rents and receipts, was illegal, and not in accordance with the 11th section of

Chapter 167 of the Acts of 1846, will depend upon what is meant in the act by the expression, "after deducting all expenses and charges of distribution;" and it seems to this Board that the decision that it was illegal must have been arrived at without a very careful examination of all the facts bearing upon the question. Going back to the earliest report on the subject of supplying the city with soft water, and following the history of the water supply down to the passage of the Act of 1846, it will be found that in the estimates made, and at the hearings before Committees of the Legislature, the engineers, the petitioners, and remonstrants, always made a distinction between bringing water to the city, and distributing it through the city; and that *distribution* was the term applied to the whole system of water-pipes within the city. The act itself keeps up the distinction, and all along down from that time until very recently, committees, commissioners, and engineers, uniformly refer to distribution as having this meaning. It is not unlikely, therefore, that the committee to whom the communication of His Honor was referred, may find that the use of the income of the works for the greater part, if not of all, the expenditures referred to, was strictly legal, and that judgment to the contrary was too hastily formed.

In common with everybody having an interest in city affairs, the Board hope and believe that the City Council, in reviewing its work, will come to a right conclusion; and, if it is found that any transfers from one account to another are necessary, they will of course be properly made. On the question of the use of water income for the payment of interest beyond the amounts due on the water loan, or water scrip, the Board have a decided opinion which has been too often stated to need repetition. Beyond this, there is at least room for doubt whether any transfer will be required. If, however, it should be necessary, a distinction will be found on the books of this Board, between construction and maintenance, which, as a matter of propriety and for convenience of reference, has always been made.

COCHITUATE DEPARTMENT.

The Board can still report favorably upon the general condition of this department, while they call the attention of the Council to the accompanying reports for more particular information concerning it.

The appearance of the property of the city at Chestnut

Hill has been very much improved the past season. The erection of a fine stone building, to be used for a barn and stable, and the removal of the old wooden buildings used heretofore for the same purpose; the completion of the terminal gate-house of the Sudbury-river conduit, an attractive and substantial edifice, located near the basins; the thriftiness of the numerous young trees set out along the roadway and through the grounds, and the good condition of the fences and walls, give an appearance of interest and care, creditable to the Superintendent in charge, and to the city.

The other reservoirs and grounds have been well cared for and kept in excellent condition. The Superintendent of the Eastern Division has expressed dissatisfaction with a portion of the fence around the Parker Hill reservoir grounds, and the construction of a new one would have been authorized, but for the refusal of the owner of the adjoining estate to bear a fair proportion of the expense. The shops and yards are in good order, and the Board know of no neglect or want of care in either division of the department.

The new Worthington pumping-engine at the Elmwood-street station has been in constant use. It does its work at much less cost than the other engines, and its performance has been, in all respects, highly satisfactory.

The report of the City Engineer gives the quantity of water diverted from Sudbury river into Lake Cochituate during eight months of the year, and the quantity diverted directly to Chestnut-hill reservoir; making the whole quantity of Sudbury-river water supplied to the city 3,422,100,000 gallons, — equivalent to a daily supply of 9,375,000 gallons. The use of Dug and Dudley ponds, the effect of the supply from Sudbury river upon the surface of Lake Cochituate throughout the year, the condition and use of both the Cochituate and Sudbury-river conduits, of the low and high service reservoirs, with a special notice of the effect of anchor ice on several days in the latter part of the month of December, 1878, the condition and use of the pumping-engines, with a statement of operations at the pumping-stations, the cost of pumping, the additions to the pipe plans, can all be found in this report. It contains also a full statement of the consumption of water in 1878, making the average daily use throughout the year, 23,205,700 gallons, — an increase of 12.2 per cent. above the consumption of 1877.

A very interesting statement from Professor Wm. Ripley Nichols, of the Massachusetts Institute of Technology, accompanies the report, which gives the results of his analyses of the water supplied by the Cochituate works, to which the

attention of the Council is specially called. His examinations show that, as in previous years, there is some variation from time to time in the quality of Boston water; but he concludes his paragraph on this subject with this remark: "We have every reason to congratulate ourselves upon the character of our water supply."

Tables on evaporation, showing the results of experiments and observations, and on the rainfalls, the heights of the reservoirs and water in the lake, the quantity of water consumed and wasted, etc., etc., are appended to the Engineer's report.

The Superintendent of the Western Division reports upon Lake Cochituate, Dug and Dudley ponds, and the Chestnut Hill and Brookline reservoirs, all under his charge, and on the grounds and property connected therewith. The condition of the Cochituate aqueduct, the pressure under which it has been run, and a particular statement of what was observed at the time of its annual examination, June 11, 1878, will be found in this report. It also gives information concerning the Sudbury-river conduit, which was given into his charge Feb. 10, 1879, and some particulars in relation to the new terminal gate-house, and the new barn and stable. A schedule of city property belonging to the Western Division is appended to this report.

From the report of the Superintendent of the Eastern Division it appears that the whole quantity of main pipe laid during the year was 40,815 feet, equal to $8\frac{1875}{2880}$ miles. 3,340 feet of pipe were relaid. The length and sizes were as follows:—

	260 feet, 60-inch.
	207 " 48 "
	7 " 16 "
	9,632 " 12 "
	10,233 " 8 "
	19,361 " 6 "
	1,115 " 4 "
	<hr/>
	40,815
Relaid,	3,340
	<hr/>
	44,155
	<hr/>
	1,628 feet 12-inch.
	561 " 6 "
	1,151 " 4 "

116 stopcocks and 117 hydrants have been put in, and 30 hydrants have been abandoned. The number of service-

pipes put in during the year was 796, or 22,943 feet in length. 245 service-pipes (2938 feet) were changed.

The total length of pipe laid from the commencement of the works to May 1, 1879, was 362 miles 3,494 feet. Total number of stopcocks, 3,889; hydrants, 4,075; service-pipes, 44,317.

The general condition of the works in this department, the report says, is good. An account of stock on hand is appended to this report.

A contract for supply of cast-iron pipes for the present year was made on the 4th of April, with Messrs. McNeals and Archer, of Burlington, New Jersey, at an average price of \$25.17 per ton, delivered, or \$1.30 per ton less than paid in 1878.

The Water Registrar reports the whole number of water-takers entered for the year 1879, 51,523, — an increase over 1878 of 1,553. The number of cases where the water has been turned off for non-payment of rates during the year is 1,423; 416 less than in 1878. Of this number 1,140 have been turned on again, leaving 283 still remaining off, or 57 less than the previous year.

The number of meters now in use is 1,089. 680 are 5–8 inch; 345, 1–inch; 43, 2–inch; 17, 3–inch; and 4, 4–inch; and water is supplied to 123 elevators, and 23 organs, where indicators are attached to determine the quantity of water consumed.

The Water Registrar's report contains tables showing the premises where meters are attached, with the quantity of water consumed and the revenue received; a statement showing the number of houses, stores, steam-engines, etc., supplied with water, with the amount of water rates received in 1878; tables showing the yearly increase of water rates from January, 1850; the yearly revenue from Cochituate water since its introduction, Oct. 25, 1848; the number and location of drinking-fountains, etc., and the number and kinds of water fixtures in the city.

The total receipts of the Cochituate Water Works, from all sources, for the year ending April 30, 1879, are as follows, viz.: —

From sales of water	\$1,011,655 21
From shutting off and letting on water and fees	3,145 75
Sundry receipts by Water Board	65,678 61

Amount carried forward,

\$1,080,479 57

Amount brought forward,

\$1,080,479 57

The total amount charged to Cochituate Water Works, for the year ending April 30, 1879, is as follows, viz. : —

Current expenses	\$166,293 06	
Extension of works paid for out of income	62,438 70	
Interest on funded debt . .	\$617,378 20	
Amount paid Mystic Water Works for water furnished East Boston	48,851 11	
Stock on hand not used . .	8,322 59	
	<hr/>	\$903,283 66

Excess of income over expenditures, paid to Cochituate Water Sinking Fund, April 30, 1879.

\$177,195 91

The outstanding Cochituate Water Loans at this date, exclusive of the Additional Supply, are as follows : —

5 per cent. Sterling Loan (£399,500)	\$1,947,273 98		
5 per cent. Gold Loans	102,000 00	}	\$2,000 Due Oct. 1, 1902
5 per cent. Currency Loan	1,000 00		100,000 Due Oct. 1, 1878
			1,000 Due April 1, 1906
			700,000 Due Oct. 1, 1907
			50,000 Due Jan. 1, 1880
			300,000 Due July 1, 1880
			200,000 Due Dec. 1, 1897
			450,000 Due Dec. 12, 1897
			540,000 Due June 16, 1898
			250,000 Due Oct. 1, 1898
			625,000 Due April 1, 1899
			688,000 Due Jan. 1, 1901
			330,000 Due April 1, 1901
			413,000 Due July 1, 1901
			38,000 Due April 1, 1903
			161,000 Due April 1, 1904
			142,700 Due Jan. 1, 1905
			6,000 Due April 1, 1905
			82,550 Due Oct. 1, 1905
			8,750 Due Jan. 1, 1906
			4,000 Due April 1, 1906
			8,000 Due Oct. 1, 1906
			5,000 Due Jan. 1, 1907
			1,000 Due April 1, 1907
			1,000 Due July 1, 1907
	<hr/>		
	\$7,053,273 98		

MYSTIC DEPARTMENT.

The laying of a second line of force main pipe from the engine house to Walnut Hill reservoir, and a pipe, connecting directly with the distributing main, so that, if necessary, a supply of water independent of the reservoir can be obtained; the construction of the new road referred to in previous reports, from the reservoir grounds directly to the pumping-station, with some alterations on the roadway around the reservoir, are the only changes of consequence made in this department during the year. All needful repairs have been attended to, and everything connected with the works and property has been well kept up.

The care of the Mystic Sewer was turned over to this department November 27, 1878, it being so nearly completed that the services of a special superintendent could be dispensed with.

The supply of water during the year has been abundant, and the quality good. A report from this Board, March 3, 1879 (City Doc. No. 30), contains the result of an examination made by Professor Nichols, of the Institute of Technology, of four samples of the water drawn from the pipes in East Boston; and the accompanying report of the City Engineer gives, in addition, the analysis of samples of mud deposits taken from the bottom of the reservoir when the water was drawn off last fall. They show no deterioration in the quality of the water, and the sewer is now carrying away large quantities of offensive matter which before found its way into streams running into the lake.

The Board have very recently made a report to the Council, on the question of a modification of the contracts with the cities of Chelsea and Somerville, and the town of Everett; the ordinance providing that these contracts may be modified by an order of the Boston Water Board, approved by the City Council. As stated in the report referred to, it would seem as if the interest of all parties to the contracts would be promoted if the changes proposed could be carried into effect.

A contract for a supply of Cumberland coal for the year was made, on the 17th of August, with Messrs. J. A. Wellington & Co., at \$5.10 per ton of 2,200 lbs., delivered and weighed at the pumping-station.

A contract for cast-iron pipes was made with Messrs. McNeals and Archer, of Burlington, New Jersey, at an average of \$25.12 per ton of 2,240 lbs., delivered as usual.

The report of the City Engineer gives the condition of the

water in the lake throughout the year; the quantity drawn from it for use, and the waste over the dam, fishway, etc.; the yield of the water-shed, equal to a daily yield of 32,986,800 gallons, the amount of rainfall on the water-shed, 47.68 per cent. of which was received into the lake: the consumption, averaging daily 8,515,768 gallons, — the largest quantity used in one day being 12,732,060 gallons, Jan. 8, and the smallest, 6,505,240 gallons, April 28, 1879. It also shows the work done at the pumping-station, with the time each engine has been run; the quantity of coal consumed, with the percentage of ashes and clinkers; of water pumped, with the cost of pumping; the height of water in the lake, and in the reservoir, with the average daily consumption during each month in the years 1876, 1877, 1878.

The Superintendent's report gives information in relation to the work done during the year at the lake, the pumping-station, and the reservoir. It gives also the condition of the conduit and its appurtenances, the engines and boilers, and of the buildings and grounds.

The Walnut-Hill reservoir was carefully examined in the fall, when the water was drawn off, which had not been done before for twelve years. It was found to be in good condition, needing but slight repairs, which are referred to and described in the report of the Superintendent, as well as the City Engineer.

The whole quantity of coal used during the year was 3,700 $\frac{528}{2200}$ tons, and the quantity on hand at this date is 305 $\frac{791}{2200}$ tons.

The additions, repairs, and condition of the supply mains and the distribution and service pipes will be found in the report of the Superintendent. It will be seen that during the past year 10,524 feet of pipe have been laid, as follows:—

New force main	3,366 feet of 30 inch.
Relaid in place of cement pipe condemned	4,128 “ 12 “
Relaid in place of cement pipe condemned	12 “ 10 “
Relaid in place of cement pipe condemned	532 “ 8 “
Relaid in place of cement pipe condemned	1,260 “ 6 “
Relaid in place of cement pipe condemned	432 “ 4 “
Extension	444 “ 12 “

Extension	.	.	.	.	.	72	feet	8	inch.
“	.	.	.	.	.	110	“	6	“
“	.	.	.	.	.	168	“	4	“

The total length of pipe laid from the commencement of the work to May 1, 1879, is 29 miles 1,070 feet. The total number of gates is 1,081, and the total number of hydrants is 235.

The number of service-pipes entered during the year is 69.

The Water Registrar reports the total number of water-takers entered for the year, 20,025, an increase over 1878 of 1,295. The number of cases where the water has been turned off for non-payment of rates during the year is 463, or 185 less than in 1878. Of this number 343 have been turned on again, leaving 120 remaining off, or 235 less than in 1878.

The number of meters in use is 202, the sizes of which are as follows : —

85 $\frac{5}{8}$ -inch; 4 $\frac{3}{4}$ -inch; 65 1-inch; 5 $1\frac{1}{2}$ -inch; 31 2-inch; 7 3-inch; 5 4-inch, and 5 meters.

Tables showing the premises where meters are attached, with the quantity of water consumed and the revenue received; a statement of the dwellings, families, stores, etc., supplied with water, with the amount of the rates received, the number and kinds of water fixtures, and the number and location of stand-pipes, drinking fountains, etc., are appended to the Registrar's report.

The total receipts of the Mystic Water Works from all sources, for the year ending April 30, 1879, are as follows, viz. :—

From sales of water	\$264,445	42
From shutting off and letting on water and fees	770	50
Sundry receipts by Water Board	3,485	18
	<u>\$268,701</u>	<u>10</u>

The total amount charged to Mystic Water Works for the year ending April 30, 1879, is as follows, viz. :—

Current expenses	\$72,308 20	
Extension of works paid for out of income	25,522 74	
	<hr/>	<hr/>
<i>Amounts carried forward,</i>	\$97,830 94	\$268,701 10

<i>Amounts brought forward,</i>	\$97,830 94	\$268,701 10
Interest on funded debt	68,027 50	
Amount paid Chelsea, Somerville, and Everett, under contracts	23,794 62	
Stock on hand, not used	7,915 63	
	<hr/>	\$197,568 69
Excess of income over expenditures paid to Mystic Water Sinking Fund, April 30, 1879		<hr/> <hr/> \$71,132 41

The outstanding Mystic Water loans at this date are as follows : —

6 per cent. currency Mystic Water Loans	\$613,000 00	{	\$26,000	Due Oct. 1, 1881
			1,000	Due April 1, 1885
			35,000	Due April 1, 1886
			60,000	Due Oct. 1, 1886
			50,000	Due Oct. 1, 1887
			3,000	Due April 1, 1888
			100,000	Due July 1, 1890
			51,000	Due Jan. 1, 1891
			139,000	Due July 1, 1891
			67,000	Due Jan. 1, 1892
			42,000	Due July 1, 1892
			39,000	Due July 1, 1893
5 per cent. currency Mystic Water Loans	410,000 00	{	100,000	Due Oct. 1, 1882
			202,000	Due Oct. 1, 1883
			6,000	Due Oct. 1, 1893
			102,000	Due April 1, 1894
6 per cent. currency Mystic Sewer Loans	130,000 00		130,000	Due April 1, 1886
	<hr/>			
	\$1,153,000 00			
	<hr/> <hr/>			

MYSTIC SEWER.

The sewer was completed and put into use in the summer of 1878. The annual report of the City Engineer (City Document No. 22, 1879) gives a full description of it, with its branches and catch-basins, and the manner of its construction; and the accompanying report of the Engineer refers to it, with some additional particulars in relation to its use. Its cost up to the present date is \$106,218.36, and the Board believe that its usefulness will be equal to its cost. With two or three exceptions the tanneries along its line have been connected with it by catch-pits and branch sewers, to be paid for by their proprietors, who have manifested a proper interest in the end to be accomplished by its con-

struction, and met the Board in a commendable and liberal spirit. The others will undoubtedly soon follow their example, as there cannot be a question as to their legal liability for contaminating the water taken by the city for use, and polluting the streams, to the injury and prejudice of others having the right to use the water; and, besides, the right to use the sewer enhances materially the value of their estates.

Settlements for land taken for the sewer, and for damage occasioned by alteration of grade, etc., have been made with nearly all the claimants, and when everything is closed up the addition to the cost, as stated, will not be large.

MYSTIC SEWER.

Balance of loan, April 30, 1878 . . .	\$124,290 57
---------------------------------------	--------------

Receipts.

Sales of old materials, etc. . . .	422 81
	<hr/>
	\$124,713 38

Payments.

To Mystic Water Sinking Fund	\$75,422 81	
Construction and land-dam-ages	25,508 93	
	<hr/>	
		\$100,931 74
		<hr/>
Balance unexpended April 30, 1879 . . .		\$23,781 64
		<hr/>

SUDBURY-RIVER DEPARTMENT.

In a communication, dated March 10, 1879 (City Document No. 37), the Board informed the Council that the appropriation for an additional supply of water had been reduced Feb. 25, 1879, to \$90,416.83, and that a further appropriation of \$350,000 would be required. The whole amount appropriated up to that date was \$5,062,886.80, and the expenditures had been \$4,872,469.97, of which \$694,671.30 was for preliminary surveys, special investigations, temporary supply, and water or mill damages. The request was based upon a careful estimate, made by the City Engineer, of the amount that would be required to complete the works, and an estimate, made by the Board, of what, in their judgment, would be necessary to cover unsettled claims for

er and land damages; and the Board believe that the amount asked for will be sufficient to cover the remaining expenditures; in which case the whole cost of the work will fall short of the original estimates at least \$300,000, while the amount paid for water and mill damages will be very small compared with what was claimed, and what it was feared, by many, might be recovered.

The work remaining unfinished on Section 10 of the conduit at the time of our last report has since been completed, and the final estimate, as made up by the Engineer, has been paid. The contractors made a claim for extra work, which the Engineer could not allow, and the Board declined to pay.

On the 25th of June, 1878, proposals for building the terminal gate-house at Chestnut Hill were opened, and a contract was afterwards made with W. H. Sayward, the lowest bidder, at \$8,960. The building has been completed, and accepted by the Board, and was paid for Feb. 27, 1879; and the Sudbury-river conduit, with its appertaining structures, as stated in the report of the Engineer, have been fully completed, and placed under the charge of the Superintendent of the Western Division of the Cochituate Works. Its use during the year 1878 can be seen by reference to the same report. Since January, 1879, it has been used 31 days, and has conveyed 889,700,000 gallons of water to the reservoir.

The conduit from Farm pond to Sudbury river, and a gate-house for the same, contracted for Sept. 20, 1878, have both been completed and paid for.

The report of the City Engineer shows what progress has been made, during the year, with the storage-basins in Framingham, and their present condition. The contractors for building the superstructures of Dams Nos. 1 and 3 have finished their work, final estimates of which have been made by the Engineer, accepted, and paid. Basin No. 3 was filled with water, for the first time, in December; and No. 1 has been kept full of water most of the winter. Plans for the gate-house for Dam No. 1 were adopted, and a contract made for its erection Aug. 28 last. The work on the superstructure of Dam No. 2 was not pushed forward to completion in the fall, as was expected. The Board deemed it expedient to extend the time for the completion of the contract, and it is hoped that the remaining work will be finished very soon.

A great deal of the work which the construction of the storage-basins and the use of Farm pond necessitated, such as building new highways and bridges, alterations in the grade of roads and private grounds, paving and protecting

railroad embankments, cleaning the basins, ditching for surface drainage, etc., etc., has been put under contract during the year. The report of the City Engineer gives a statement of all these contracts, finished and unfinished, with necessary information concerning them. The same report contains a record of the rainfall in the Sudbury-river water-shed for the year ending at this date, 53.82 per cent. of which found its way into the river; and also the total yield of the river and Farm pond for the same period, equal to an average daily flow of 103,100,000 gallons.

On the 28th of October, 1878, by vote of the Board, the Engineer was directed to restore the highways, etc., intersected by the ditch connecting Farm pond with Beaver-dam brook, which had formerly been used for a temporary supply of water, but was no longer of any service to the city.

The following statement shows the takings of water and lands under the Sudbury-river Act of 1872, the dates indicating what has been done since our last report:—

Statement of "Takings" made by the City of Boston, under the Sudbury-river Act of 1872, Chap. 177.

Number.	Date.	What Taken.	Registry.	Date of Filing.	Book of Record.	Page.	Remarks.
"A" 1.	Jan. 21, 1875.	Waters of River	Middlesex .	Mar. 17, 1875.	Book of Partitions,	27	No Plan.
"B" 2.	Mar. 16, "	Lands in Framingham for Basin No. 1. (Partial.)	"	" 22, "	"	27	No Plan.
"C" 3.	June 18, "	Lands of Austin, Donaldson, and Fisher in Newton. (Tunnel.)	"	June 19, "	"	27	Plans with original records.
"D" 4.	" 26, "	Lands in Framingham, Sherborn, and Needham, as per Land Plan No. 1, and Lands in Newton as per Land Plan No. 3.	"	July 6, "	"	27	{ Land Plans Nos. 1 and 3 filed.
"E" 5.	" 26, "	Lands in Needham, as per Land Plan No. 2.	Norfolk . .	" 7, "	Book of Deeds, Lib. 468	221	Land Plan No. 2 filed.
"F" 6.	Sept. 30, "	Land of David Tyler in Sherborn. (Additional.)	Middlesex .	Oct. 7, "	Book of Partitions,	27	Plan with original records.
"G" 7.	Dec. 8, "	Lands in Framingham for Basin Nos. I. and III. (Partial.)	"	Dec. 10, "	"	27	Plan filed.
"H" 8.	April 18, 1876.	Lands of E. C. Dudley and Dennis Leary, in Needham. (Additional.)	Norfolk . .	April 24, 1876.	Book of Deeds, Lib. 478	237	Plan with original records.
"I" 9.	" 18, "	Lands of Myra C. Mills and James D. Cahill, of Newton. (Additional.)	Middlesex .	May 5, "	Book of Partitions,	27	Plan with original records.
"J" 10.	July 28, "	Lands in Framingham for Basin Nos. I. and III. (Partial.)	"	Sept. 8, "	"	27	Plan filed.
"K" 11.	Dec. 26, "	Basin No. III. (Partial.)	"	Jan. 17, 1877.	"	27	Plan filed.
"L" 12.	" 28, "	Basin No. III. (Partial.)	Worcester .	" 31, "	Book,	182	Plan with original records.
"M" 13.	April 26, 1877.	Lands of Henry F. Durant et als. in Needham	Norfolk . .	May 22, "	"	490	Plan with original records.
"N" 14.	June 1, "	Lands of Devises of S. D. W. Harris, Camp Meeting Association, and B. T. Manson, in Framingham, and land of Henry Lee, in Newton	Middlesex .	July 14, "	Book of Partitions,	27	No Plan.
"O" 15.	April 13, 1878.	Lands of Commonwealth of Mass., B. C. F. and N. B. R. R. Co., Framingham, land of Horace Barber in Sherborn, land of Jane Welles in Natick, land of Caroline T. Clark in Newton	"	May 21, 1878.	Book,	1476	{ Plans of Commonwealth, B. C. F. & N. B. R. R. Co., and C. T. Clark, with original records.
"P" 16.	June 8, "	Lands in Framingham and Ashland for Basin No. II.	"	July 2, "	Book of Deeds, Lib. 1481	262	Plan filed.
"Q" 17.	Aug. 21, "	Lands in Framingham, on westerly side of Farm pond, of C. R. Woolson et als.	"	Aug. 23, "	"	1487	Plan filed.

Fifty-six claims have been settled and paid during the year, amounting to \$458,997.93; which, added to former settlements, makes the whole number 204, and the whole amount \$930,527.23.

In addition to these, agreements have been made for the settlement of 5 more, amounting to \$15,650, — to be paid as soon as the necessary releases have been signed. Out of the 209 claims, 6 only have been tried in court, and verdicts rendered by juries. The judgment and execution, with costs, for 3 of these, were less than the awards of Commissioners, or the offer of the Board, and for the others considerably more. Several important claims are now on the trial list of cases in court, and must soon be determined. The Board hold themselves ready always to meet the claimants in an amicable settlement if possible, and they appeal to, or wait for the decision of the courts, only as a matter of absolute necessity.

The following statement shows the appropriations by the City Council for an additional supply of water, with the loans issued to meet them, and the amount of expenditures to this date: —

ADDITIONAL SUPPLY OF WATER.

APPROPRIATIONS.

Oct. 21, 1871. — Transfer from Reserved Fund.	.	\$10,000 00
Apr. 12, 1872. — Order for Treasurer to borrow	.	100,000 00
Apr. 11, 1873. — " " "	.	500,000 00
Feb. 26, 1875. — " " "	.	1,500,000 00
July 1, 1876. — " " "	.	2,000,000 00
Apr. 20, 1878. — " " "	.	600,000 00

Total appropriations to April 30, 1878 . . . \$4,710,000 00

Oct. 1, 1875. — Premium on \$1,000,000 bonds under order of Feb. 26, 1875,	\$83,700 00
April 1, 1876. — Premium on \$452,000 bonds, under order of Feb. 26, 1875.	47,786 80
Oct. 1, 1876. — Premium on \$2,000,000 bonds, under order of July 1, 1876	221,400 00
	<hr/> 352,886 80

Carried forward,

\$5,062,886 80

Brought forward,

\$5,062,886 80

EXPENDED.

1871-72	\$2,302 81
1871-73	61,278 83
1873-74 including \$20,897.50 dis- count on bonds sold January, 1874	114,102 77
1874-75	224,956 68
1875-76	783,613 49
1876-77	1,924,060 24
1877-78	1,257,715 26
1878-79	635,658 08
	<hr/> 5,003,688 16

Balance of appropriations unexpended April 30, 1879. \$59,198 64

Balance of loans April 30, 1878 . . . \$94,856 72

Receipts.

Sales of land, etc.	\$9,874 21
New loan issued	600,000 00
	<hr/> \$ 704,730 93

Payments.

To sinking fund	\$9,874 21
Sundry payments for construc- tion, land-damages, etc.	635,658 08
	<hr/> \$645,532 29

Balance unexpended April 30, 1879 . . . \$59,198 64

The outstanding loans which were made on account of Ad-
ditional Supply of Water are as follows:—

4 per cent. Currency Loans, \$588,000		Due April 1, 1908
5 per cent. Gold Loans, \$3,452,000	\$1,000,000	Due Oct. 1, 1905
	452,000	Due April 1, 1906
	2,000,000	Due Oct. 1, 1906
5 per cent. Currency Loan, 12,000		Due April 1, 1908
	100,000	Due July 1, 1902
6 per cent. Currency Loans, \$648,000	492,000	Due April 1, 1903
	8,000	Due Jan'y 1, 1904
	48,000	Due July 1, 1905
	<hr/> \$4,700,000	

New Loan ordered April 11, 1879, but not issued, \$350,000 00

WASTE.

The consumption of water from the Cochituate Works for the year 1878 reached 8,470,075,300 gallons, averaging daily 23,205,700 gallons, a considerable increase over the consumption in 1877. We are now using nearly 80 gallons of water to each inhabitant, which is at least double what we should use. In January, 1876, the average daily use reached 28,400,000 gallons, or about 100 gallons per person. There can be no question that the quantity of water wasted is very large, and that something should be done to prevent it. The Board have never been unmindful of this fact, and have felt that it was one of their most important duties to seek out a remedy for the evil. Waste is never justifiable, not even in the use of water. Within a few months the City Engineer has called the attention of the Board repeatedly and specially to the subject, and emphasized his fears as to the result if some preventive measures are not soon taken. In his report will be found an elaborate statement of the case, with diagrams and figures to illustrate and show the correctness of the position which he takes.

The large expense already incurred for an additional supply of water could have been postponed, he thinks, for a number of years longer, if the fact of enormous waste had been appreciated by the public eight or nine years ago; and, "unless it be appreciated and acted upon now, heavy additional outlays will be required in the near future to enlarge the distributing system of the Cochituate Works, and to increase the storage capacity of the sources of the Mystic supply."

The use of improper fixtures and bad plumbing, the report says, are largely the cause of the waste, and are at the same time among the enemies to the public health against which it has to contend. Quotations from the early reports of commissioners appointed to consider the best mode and the expense of bringing water into the city are given, to show that the estimated measure of supply was, in 1844, 28½ wine gallons to the inhabitant, and in 1845, by another commission, 30 gallons; which quantity was calculated to cover all the uses to which water is now put. Annexed to the report are profiles showing the increase in consumption and of the water-takers since 1850; the variation of the consumption, with its causes other than waste; the number of gallons consumed per taker; the average monthly supply from the Cochituate Works since 1850, and from the Mystic since 1865; the average monthly rainfall and temperature; and other information having a bearing upon the question under consideration.

Particular attention is called to the sudden rise of the profile line during the last year, as it indicates a great increase of waste, and shows the present tendency. The fact that the water is suffered to run to prevent the effects of frost in winter, and is lavishly used through hose and defective water-closets in the summer, is commented upon, and the extent of this deliberate waste is shown in the profiles referred to. A similar profile is given of the high-service works, showing, in addition, how rapid has been the increase of consumption which from 1875 to 1878 went up 63 per cent., while the increase in takers in the same time was only about 35 per cent. Diagrams showing the hourly consumption of water, and a comparison of the consumption of Boston with St. Louis, where no attempt is made to check waste, and Fall River, where meters are in quite general use, accompany the report; and also tables showing in figures the facts illustrated by the diagrams, one of which gives the daily average consumption of water in various American cities.

The report also gives a comparison of the amount received for water used for domestic or household purposes, and that received for water sold by meter; showing that while the rates for the former were originally based upon a much higher price than $2\frac{1}{2}$ cents per 100 gallons (the meter price) the amount received was only $1\frac{11}{100}$ cents, and that the income from the sale of water, which at $2\frac{1}{2}$ cents per 100 gallons for the whole quantity used, would have reached \$2,122,500 at the present rates, was only \$945,329.96.

The waste in the high-service district increases largely the cost of pumping, and if the present rate of increase of consumption with the disproportionate use of water in the winter months is not materially lessened, new works must soon be commenced.

The pressure in the pipes of the Cochituate low-service has been very seriously reduced by over-consumption and waste, so that at times it has been impossible to draw a full supply in the upper stories of high buildings, and complaints of an inadequate supply, with pressing applications for extension of the high-service pipes, have been frequent during the past winter. To restore the pressure, either the consumption must be reduced, or a new distributing-main be laid from Chestnut-Hill reservoir, and other extensions must soon follow if the present policy of allowing unrestricted use of water is continued. The Engineer says that the first cost and the cost of operating the new system of intercepting sewers will be largely increased by the excessive use and waste of water.

He mentions three methods of limiting or preventing waste

that have been adopted or proposed in various cities. 1st. The rigid enforcement of ordinances prescribing the class of fixtures that may be used, and requiring plumbing to be done under competent inspection. 2d. Thorough house to house inspection, to discover faulty fixtures, and to detect waste from whatever source it may arise. 3d. The application of meters to the service-pipes, or the sale of water by meter measurement only.

In regard to plumbing, the Engineer is of opinion that millions of expenditure would have been saved to the city if early attention to this subject had been given; and it certainly seems as if the city had to bear, and pay for, all the evil effects of improper plumbing.

Thorough house to house inspection, when district waste metres, to record the work of the inspectors and measure its effect, are used, in connection with day and night inspection, will give, he says, the best of results, with but moderate cost. In this connection he mentions a meter for the purpose, invented by Mr. Deacon, City Engineer of Liverpool, England, and gives extracts from a recent pamphlet on the subject, published by the inventor, showing the effect of faithfully carrying out this method of preventing waste. Several cities and towns in Great Britain are instanced, where the consumption of water has been greatly reduced by it. Water will always be used more freely here than abroad, and the Engineer thinks that it will hardly be desirable to attempt to reduce the consumption below 40 or 45 gallons per head, which is double the quantity used in the cities referred to.

The effectiveness of the third method mentioned would be beyond question; but there are serious objections to its general application in large cities and to old works, although meters could be a good deal more extensively used than now with advantage. In Providence and Fall River meters are generally used, and the consumption in each place is about 40 gallons per consumer. In Cambridge, where a system of inspection particularly directed to the discovery of leaks in the streets and sewer-pipes is maintained, the consumption is about 50 gallons per consumer.

While asking for the special attention of the City Council to these statements of the City Engineer, the Board feel called upon to add their decided opinion that the time has fully arrived when active measures should be taken to check the growing tendency to waste among water-takers, and to save the treasury from excessive and unnecessary expenditure. All the demands of health, comfort, and luxury, can be fully met by the present water-supply; but deliberate

waste should not be encouraged, and ought to be prevented. Exactly how this is to be done has not yet been determined, but some rule must soon be adopted to limit and control the use of water ; and wasteful water-takers must be preparing for its operation.

TIMOTHY T. SAWYER, *Chairman*.
ALBERT STANWOOD,
LEONARD R. CUTTER.

REPORT OF THE CITY ENGINEER.

OFFICE OF CITY ENGINEER,
CITY HALL, BOSTON, May 1, 1879.

HON. T. T. SAWYER, *Chairman Boston Water Board*:—

SIR,—In compliance with the requirements of the ordinance establishing the Boston Water Board, the following report is respectfully submitted:—

COCHITUATE WORKS.

SUDBURY RIVER AND LAKE COCHITUATE.

During 1878, 2,688,300,000 gallons of water have been diverted from Sudbury river into Lake Cochituate, as follows:—

February,	5 days	.	.	.	4,700,000 gallons.
March,	12 "	.	.	.	12,000,000 "
May,	5 "	.	.	.	98,000,000 "
June,	19 "	.	.	.	504,100,000 "
July,	21 "	.	.	.	177,300,000 "
August,	31 "	.	.	.	747,200,000 "
September,	25 "	.	.	.	287,300,000 "
October,	19 "	.	.	.	661,600,000 "
November,	5 "	.	.	.	176,100,000 "
Total, 142 days . . .					2,668,300,000 "

This quantity, if equally distributed through the year, would give a daily supply of 7,310,400 gallons. In addition to the above, 753,800,000 gallons were diverted from the river directly to Chestnut Hill reservoir through the new conduit; making the total amount of Sudbury-river water supplied to the city during the year, 3,422,100,000 gallons, equivalent to 9,375,000 gallons per day.

The Dudley-pond supply has not been drawn upon. Dug

pond has furnished to the lake about 390,000,000 gallons during the months of January, February, March, April, May, and December. Dug pond is the source of supply to the town of Natick, and the above figures show its yield in excess of the town supply.

The surface of the water in the lake stood 11 feet above the bottom of the conduit, on January 1st, 1878; on the 10th it had fallen to 10 feet 7 inches, which was the lowest point reached in 1878. The supply from Sudbury river has kept the lake surface within one or two feet of high-water mark throughout the year; on January 1, 1879, it stood at 12 feet above the conduit invert.

There has been an overflow at the outlet dam from January 15 to February 5, from February 10 to 19, from February 22 to April 3, from April 30 to May 6, and from November 22 to December 31; the total waste being 3,341,875,000 gallons, equivalent to 9,155,800 gallons per day for the whole year.

COCHITUATE CONDUIT.

The tables on page 70 show the depths of water in the conduit at Lake Cochituate gate-house, the number of days it was running at those depths, and the average depth for each month.

The yearly examination of the aqueduct was made June 11, and no noticeable change since the previous examination was found.

SUDBURY-RIVER CONDUIT.

This conduit was practically finished in the fall of 1877, and has been used 52 days during the past year to convey water direct from Farm pond to Chestnut-Hill reservoir. It was first used for this purpose February 13, 1878. On February 10, 1879, it was placed under the charge of the Superintendent of the Western Division of the Cochituate Water Works, and the cost of its care and maintenance has, since that date, been charged to the general Water Works appropriation. It is now in regular service.

LOW-SERVICE RESERVOIRS.

The tables on page 64 show the monthly and yearly average heights above tide-marsh level for a series of years, of the surface of water in Brookline and Chestnut-Hill reservoirs. The yearly average in each reservoir has been 1.04 ft. greater than in 1877.

From Dec. 24 to 26 considerable trouble was experienced at the reservoirs on account of anchor-ice, and the supply to the city came very near being stopped. On the night of the 24th the flow of water at Chestnut-Hill reservoir was entirely stopped; but for some unknown reason the ice started during the night of the 25th, and the passages were kept clear thereafter by constantly revolving and cleaning the screens. On the morning of the 26th the outlet sluices of the Brookline reservoir became completely choked; but by the use of steam, and by raising and lowering the gates to vary the pressure against the ice-barriers, they were cleared late in the afternoon. During the day surface-ice formed, and after the reservoirs became covered there was no further trouble.

The Beacon-Hill and South Boston reservoirs have not been in use.

PIPES AND PIPE PLANS.

No important changes have been made in the pipe system during the year; only 7 miles of pipes have been laid.

The plans have been corrected as usual.

Thirty new plans have been made, showing the more important pipe connections, and copies of them, bound in book form, have been given to the Superintendent of the Eastern Division and his assistants.

HIGH-SERVICE RESERVOIR AND PUMPS.

Parker-Hill reservoir, with its grounds and buildings, is in good condition. The average height of water in it has been 217.36 feet above marsh level, or 1.12 feet higher than in 1877. (See table, page 65.)

The table on the next page shows the work done by the pumping-engines in 1879, the running-time of each engine, the amount of coal consumed, and the average monthly and yearly duties. Most of the pumping has been done by the new Worthington engine, as it does its work at a much less cost than the others. Its average duty has been 50,144,300 ft. lbs. per 100 lbs. of coal (without deductions for clinkers and ashes), while that of Engines 1 and 2 (non-condensing) has been 28,222,500 ft. lbs. only.

Average number of gallons pumped per lb. of coal: —

Worthington engine	538.3
Nos. 1 and 2	300.4

The average daily quantity pumped was 2,063,460 gallons, — an increase of 20 per cent. upon the quantity pumped in 1877.

Statement of Operations at the Highland Pumping-Station for the year 1878.

1878.	Engines No. 1 and No. 2.			Worthington Engine.		Total amount pumped at station.	Daily average pumped.	Lbs.	Total amount coal consumed.	Daily average amount coal consumed.	Per cent. ashes and clinkers.	Quantity pumped per lb. of coal.		Lift in feet.	Duty in ft. lbs. per 100 lbs. of total coal.				
	Pumping time.		Amount pumped.	Gallons.	H'rs.							Gallons.	Feet.		Ft. lbs.	Engines Nos. 1 & 2.	Worthington Engine.		
	No. 1.	No. 2.																H'rs.	Gallons.
January	557½	507½	50,349,300	15,670,250	154½	66,525,550	2,145,985	203,500	6,629	14.9		301.8		113.19	28,837,000	40,375,300			
February	510½	508	44,189,400	14,380,900	133	58,570,300	2,091,796	179,000	6,393	16.		298.		113.42	28,128,800	45,574,000			
March	102	102	8,309,600	52,064,900	574	60,374,100	1,947,552	129,500	4,317	16.2		310.	507.	109.96	28,493,200	46,392,000			
April				58,667,500	630	58,667,500	1,955,583	113,600	3,787	16.1			516.4	109.72		47,259,700			
May				62,697,500	651	62,697,500	2,022,500	116,800	3,768	15.6			536.8	110.19		49,329,200			
June				63,922,000	617½	63,922,000	2,130,733	119,600	3,987	15.4			534.5	112.73		50,247,800			
July				68,603,000	645	68,603,000	2,213,000	127,200	4,103	14.8			539.3	112.73		50,705,400			
August				58,404,000	651	58,404,000	1,884,000	107,000	3,452	15.4			545.8	110.88		50,475,200			
September				61,070,000	630	61,070,000	2,035,667	110,400	3,680	13.5			553.2	113.19		52,219,500			
October				64,480,000	651	64,480,000	2,080,000	113,400	3,658	13.1			568.6	109.26		51,924,000			
November				62,046,500	609½	62,046,500	2,068,217	106,500	3,550	13.			582.6	108.80		52,864,800			
December		11	439,450	67,363,000	641	67,363,000	2,187,176	123,300	3,977	13.9		213.3	554.9	110.42		51,098,600			
Average and totals .	1,170	1,188½	103,787,750	649,375,150	6,587½	753,162,900	2,063,460	1,551,800	42,515	14.9		300.4	538.3	111.69	28,222,500	50,144,300			

COST OF PUMPING.

Salaries	\$3,743 96
Fuel	3,714 29
Repairs	2,206 60
Oil, waste, and packing	255 01
Gas and small supplies	358 80
Total,	<hr/> \$10,278 66

The cost of pumping 1,000,000 gallons 1 foot high in each year since the high-service works have been in operation is as follows:—

1871 . . . \$0.37	1875 . . . \$0.22
1872 . . . 0.34	1876 . . . 0.18
1873 . . . 0.283	1877 . . . 0.137
1874 . . . 0.244	1878 . . . 0.122

The engines are in excellent condition.

Boilers 1 and 2 have been thoroughly repaired during the year; the engines, engine-house, and boilers have been painted, and metallic packing has been applied to the steam pistons of the Worthington engine.

BRIGHTON HIGH-SERVICE.

The daily quantity of water pumped at this station has varied from 20,000 to 150,000 gallons. The works are in good condition.

CONSUMPTION AND QUALITY OF WATER.

The table on page 66 gives the average daily consumption of water from the Cochituate Works for each month.

The average daily consumption for the year was 23,205,700 gallons,—an increase of 12.2 per cent. above the consumption of 1877.

The following report of Prof. Nichols, of the Mass. Institute of Technology, who has kindly furnished the results of his analyses of the water supplied by the Cochituate Works, will be found of interest.

The water is a mixture of Sudbury river and Lake Cochituate waters, and the analyses show its condition when delivered to the consumer.

When compared with those made two years ago (see Water Board Report, City Doc. No. 57, 1877) they show an increase in the amount of organic matter, but the proportion

of nitrogen to carbon, as determined by the Frankland process, is such as to indicate that this matter is of vegetable origin.

In the first Annual Report of the Water Board of the City of Boston, for the year ending April 30, 1877, was published a statement of the results of the weekly chemical examination of the Boston Water Supply, from July, 1876, to July, 1877.

Although the regular weekly examinations then ceased, occasional partial examinations have since been made in my laboratory, and the results are included in Table I. These results show that as in previous years, and as indeed is true in general of surface water, there is some variation from time to time; in the case of the Boston water the average character of the water does not differ essentially from that previously reported. The water is always somewhat colored, owing to the presence of dissolved vegetable matter, and, although it generally appears quite clear to the eye, a good filter will remove some suspended matter, mostly vegetable; there is no evidence, however, that the color or suspended matter which are common to all soft surface waters are at all unwholesome, and we have every reason to congratulate ourselves on the character of our water-supply.

The examinations reported in Table I. have been made by what is known as Wanklyn's method. Although this method is in very general use, and is valuable in the sanitary examination of water, I have for some time felt a desire to examine our own and other waters by what is known as Frankland's method. This method, which is felt by many to give more valuable results, especially when it is a question of statistics, consists in evaporating a certain quantity of water to dryness under suitable conditions, and then burning the residue in closed vessels in such a manner as to convert all the *carbon* and *nitrogen* of the organic matter into gaseous substances, which can be readily collected and measured. In this way may be determined the "organic carbon" and "organic nitrogen," and the method comes nearer to giving the actual amount of organic matter than any other which has ever been employed.

The method is difficult and tedious, requiring the use of expensive and frangible apparatus, and consuming considerable time; for these reasons it can never be a popular method. Moreover, as is the case with every method employed for obtaining indications of the amount and character of the organic matter in a water, the results must be interpreted by a knowledge of the source from which the water is derived, and of its surroundings. In interpreting the results it is felt that great importance attaches to the relative proportion of carbon to nitrogen, for it is in general true that organic matter of vegetable origin contains a larger proportion of carbon, while organic matter of animal origin contains a larger proportion of nitrogen.

Since February 28 of this year I have had weekly examinations made of the Boston water by my assistant, Mr. J. E. Hardman, S.B., who, in order to perfect himself in the method, spent a considerable time in Dr. Frankland's laboratory in London. The results are recorded in Table II., and will make it possible to compare the character of our water, as far as the organic matter goes, with the great number of waters examined by the Rivers Pollution Commission in Great Britain, whose reports are a storehouse of information in the matter of water supply.

For the sake of comparison I have prepared a table,—Table III.,—in which are brought together some of the results obtained on other waters. It is a matter of regret that I have not yet, as I hope even-

tually to have, the record of the examination in this way of other waters in our own State. It may, however, be said that surface waters charged with dissolved vegetable matter are used much more frequently in this country, especially in New England and the Middle States, than in England and on the Continent, and on this account the average amount of organic matter in our waters will no doubt prove larger.

There are, as far as I am aware, no earlier examinations of Boston water by this method, with which we can compare these results, except a few that were made in my laboratory in the spring of 1877. These results, which were obtained by Mr. C. N. Waite, S. B., I did not publish, because I did not feel that we had had sufficient experience with the method. I have now, however, no doubt that the results were substantially accurate. The average of seven determinations made between April 27 and May 11, 1877, was: organic carbon, 0.395, and organic nitrogen, 0.040. The ratio would be $C : N = 9.9 : 1$.

I desire to call attention to a fact which I have often emphasized, and which appears clearly in Tables II. and III., namely, that surface (and other) waters are subject to considerable variation, and, to obtain a satisfactory idea of the character of a given water, repeated examinations are necessary.

As this report may fall into the hands of some who are not familiar with our water, it may be said that the water, which is derived in part from Cochituate lake and in part from Sudbury river, is very soft; that the amount of solid matter varies from 3.75 to 5.75 parts in 100,000; that the chlorine is about 0.3, and that there is almost no nitrogen in the form of nitrites or nitrates.

TABLE I.—*Examination of Boston Water as drawn in the Laboratory of the Massachusetts Institute of Technology.*

(Results expressed in parts in 100,000.)

Date.	Ammonia.	"Albuminoid Ammonia."	Date.	Ammonia.	"Albuminoid Ammonia."
1877.			1878.		
July 5	0.0048	0.0155	June 25	. . . . .	0.0144
" 11	0.0051	0.0144	July 2	0.0035	0.0139
" 18	0.0051	0.0155	" 16	0.0035	0.0136
" 24	0.0056	0.0160	" 23	0.0045	0.0115
" 25	0.0053	0.0160	Aug. 13	0.0037	0.0136
Aug. 1	0.0051	0.0160	" 20	0.0037	0.0160
" 7	0.0045	0.0152	" 27	0.0035	0.0141
" 15	0.0048	0.0160	Oct. 22	0.0029	0.0141
Sept. 10	0.0045	0.0155	Nov. 7	0.0056	0.0181
" 26	0.0037	0.0181	Dec. 7	0.0067	0.0160
Oct. 3	0.0048	0.0195	1879.		
" 15	0.0043	0.0181	Feb. 12	0.0048	0.0149
" 20	0.0064	0.0176	" 20	0.0037	0.0144
1878.			" 27	0.0035	0.0133
March 22	0.0043	0.0144	March 6	0.0040	0.0128
" 30	0.0040	0.0128	" 13	0.0043	0.0125
April 20	0.0029	0.0141	" 20	0.0064	0.0128
May 4	0.0032	0.0123	April 4	0.0051	0.0165
" 14	0.0037	0.0112	" 11	0.0053	0.0149
June 4	0.0048	0.0136	" 17	0.0037	0.0160
" 12	0.0029	0.0125			
" 19	0.0040	0.0163	Average .	0.0044	0.0148

TABLE II. — *Examinations of Boston Water by Frankland's Method.*

(Results expressed in parts in 100,000.)

Date.	Temperature in degrees Centigrade.	Organic Carbon.	Organic Nitrogen.	Ratio. Carbon Nitrogen
1879.				
Jan. 28	. . . .	0.315*	0.042	7.5
Feb. 6	. . . .	0.369*	0.041	9.0
" 7	. . . .	0.342*	0.041	8.3
" 13	3.2	0.377*	0.043	8.8
" 20	2.7	0.504	0.049	10.3
" 27	3.0	0.438	0.041	10.7
March 6	3.2	0.475	0.043	11.0
" 13	6.2	0.385	0.046	8.4
" 20	3.2	0.517	0.064	8.1
" 27	5.2	0.485	0.069	7.0
April 4	4.7	0.485	0.092	5.2
" 11	5.2	0.418	0.061	6.9
" 17	6.4	0.412	0.059	7.0
" 24	8.1	0.366	0.034	10.8
May 1	8.7	0.407	0.057	7.1
" 8	10.5	0.397	0.051	7.8
" 15	13.3	0.362	0.039	9.3
" 22	15.4	0.327	0.042	7.8
" 29	16.9	0.390	0.060	6.5
June 5	18.4	0.464	0.060	7.7
" 12	18.3	0.355	0.050	7.1
" 19	17.4	0.370	0.051	7.3
Average	. . . .	0.408	0.052	7.9

* Each of the results reported above, from January 28, until, and including, April 17, is the mean of two very closely agreeing determinations, but I have reason to fear that the four carbon determinations which are marked with a * are a trifle too low. The nitrogen on the same dates I believe to be correct. After we had obtained complete control of the process I did not feel it necessary to make the determinations in duplicate on every occasion.

TABLE III. — *Examinations of Various Waters by Frankland's Method.*¹

(Results expressed in parts in 100,000.)

Date.	Description.	Organic Carbon.	Organic Nitrogen.	Ratio. <u>Carbon</u> Nitrogen
Jan. to June, 1879 .	Average of 22 samples Boston Water	0.403	0.052	7.9
	Unpolluted rain water. Average of 39 samples	0.070	0.015	4.7
	Unpolluted upland surface water. Average of 195 samples . . .	0.322	0.032	10.1
	Unpolluted deep well water. Average of 157 samples . . .	0.061	0.018	3.4
	Unpolluted spring water. Average of 198 samples	0.056	0.013	4.3
	<i>Unfiltered Thames Water, London.</i>			
Jan. 31, 1873	Lambeth Company	0.325	0.076	4.3
	Southwark & Vauxhall Company	0.285	0.050	5.7
Feb. 3, 1873	Grand Junction Company . . .	0.246	0.033	7.5
Feb. 1, 1873	Unfiltered Lee Water, London .	0.363	0.082	4.4
1873	<i>Variation in Filtered Water of Lambeth Co.</i>			
	Average of 12 monthly samples.	0.206	0.040	5.1
	Maxima (not at the same time) .	0.449	0.065	6.9
	Minima (not at the same time) .	0.130	0.021	3.0

¹ From the Sixth Report of the Rivers Pollution Commission.

EVAPORATION.

The experiments upon evaporation from water-surfaces in the summer months at Beacon-Hill and Chestnut-Hill reservoirs have been continued. The result will be found in the following tables :—

Table showing the Amounts of Evaporation at Beacon-Hill and Chestnut-Hill Reservoirs and the Temperature of Air and Water at different Stations on the Water Works.

1878.	EVAPORATION IN INCHES.					TEMPERATURE OF AIR.						TEMP. OF WATER.	
	Beacon-Hill Reservoir.			Chestnut-Hill Reservoir.		Chestnut-Hill Reservoir.			Parker-Hill Reservoir.			B'line Res.	Myst. E.H.
	Reservoir.	Wooden Tank.	Tin Tank.	Wooden Tank.	Tin Tank.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Mean.	Mean.
Jan. . .	...	...	...	...	...	47	-9	27	48	-12	26	38	35
Feb. . .	...	...	...	...	...	51	5	28	50	4	28	37	34.5
March . .	...	...	...	...	...	64	13	40	66	11	39	40	38
April . .	...	...	...	...	...	72	31	49	71	30	47	48	48
May . .	3.72	3.65	4.07	4.06	4.76	85	37	57	77	36	55	59	60
June . .	3.69	4.58	4.88	5.26	5.79	95	44	65	87	43	63	66	67
July . .	7.51	6.08	6.01	6.66	8.19	98	50	74	92	55	73	76	77
August .	3.50	4.05	4.89	4.23	5.18	85	48	69	84	51	68	73	73.5
Sept. . .	4.41	3.58	4.31	4.04	5.31	89	37	63	87	38	63	70	70
Oct. . .	2.84	2.49	3.24	2.92	4.66	76	29	55	74	31	55	59	60
Nov. . .	...	...	...	...	...	56	20	39	57	20	39	45	46
Dec. . .	...	...	...	...	...	57	9	29	57	10	28	37	37

Table showing the Evaporation during Periods of a few Days when the Observations were not affected by Rain.

1878.	Number of Days.	BEACON-HILL RESERVOIR.			CHESTNUT-HILL RESERVOIR.		TEMPERATURE.	
		Reservoir.	Wooden Tank.	Tin Tank.	Wooden Tank.	Tin Tank.	Water in Reservoir.	Air.
May 17th to May 30th	13	1.49	1.79	1.93	2.10	2.09	59	58
June 1st to June 8th	7	1.20	1.33	1.42	1.46	1.59	65	61
June 24th to July 9th	15	2.82	3.34	3.87	3.69	4.04	75	76
July 12th to July 20th	8	1.65	1.68	2.04	1.63	1.97	77	73
August 12th to August 19th	7	1.00	1.03	1.17	1.06	1.17	73	72
August 26th to August 31st	5	0.64	0.79	0.97	0.80	1.05	69	66
September 14th to September 26th .	12	2.08	1.96	2.42	1.85	2.50	68	62
September 30th to October 9th . .	9	0.94	0.99	1.31	1.07	1.49	65	59
October 16th to October 23d	7	0.75	0.63	0.81	0.74	0.95	58	58

Mr. Fitzgerald, Superintendent of the Western Division, has made, at my request, some experiments to determine approximately what is the evaporation from snow surfaces in the winter months. For this purpose, a box having an area of 1,732 square inches was used. It was filled to a depth of about 9 inches with a mixture of sand, clay, loam, etc., and was sunk into the ground, being protected by a wooden frame, within which it could be easily raised or lowered.

The losses suffered by the snow, whether by evaporation or filtration, were determined by weighing the box and its contents twice per day. One ounce in weight represented $\frac{1}{1000}$ of an inch in depth of water. The scales used were not sufficiently delicate in adjustment to admit of obtaining the true weight within less than 5 oz.

Whatever filtered through the earth-filling was caught in a pan and weighed separately. After the earth-filling became once frozen, however, it was water-tight, and nothing filtered through till the spring thaw, though, at times, several inches of water stood on the surface.

The following is a summary of the results of the experiments : —

The number of days with snow in the box, giving good results for evaporation, were 37 ; the number of nights, 28.

During the 37 days, of 9 hours each, there was evaporated, in

December, 3 days,	.005"	Average per day,	.001"
January, 21 "	.190"	" " "	.009"
February, 11 "	.255"	" " "	.023"
March, 2 "	.048"	" " "	.024"
<hr/>		<hr/>	
Total, 37 "	.498"		.057"

An average of .014 per day of 9 hours.

During the 28 nights there was evaporated, in

December, 2 nights,	.005"	Average,	.002"
January, 16 "	.055"	" "	.003"
February, 9 "	.130"	" "	.014"
March, 1 "	.007"	" "	.007"
<hr/>		<hr/>	
Total, 28	.197"		.026"

Or, an average of .006 per night of 15 hours.

The sum of the two averages gives .02 for 24 hours, as the general average for the winter.

RAINFALL.

A table showing the monthly rainfalls in 1878, at various points in Eastern Massachusetts, and others showing the daily falls at Cochituate and Mystic Lakes, are appended.

MYSTIC WORKS.

MYSTIC LAKE.

The water in the lake during the months of January, February, March, April, May, and June, remained near high-water mark, there having been continuous waste over the dam from January 1 to June 5.

On the 1st of August the lake surface had fallen to 3.88 feet above tide-marsh level; Aug. 10 it had risen again to near high-water mark, and was allowed to waste until the 18th. Sept. 1 it stood at 5.55; Oct. 1, 4.47; Oct. 12, 3.50, — the lowest point reached during the year. Nov. 1, 4.48; Dec. 1, 6.63; Jan. 1, 1879, 5.44; and at this date (May 1) it stands at 6.06 above tide-marsh level. Water

has been wasted at the dam from Nov. 20, 1878, to Jan. 6; from Jan. 11 to 14; from Jan. 20 to 26, and from Feb. 11 to May 1, 1879.

High-water mark is 11.17 feet above the bottom of the conduit, or 7.00 feet above tide-marsh level.

The total yield of the Mystic water-shed for the year 1878 is shown by the following figures:—

	Gallons.
Quantity drawn from the lake for use,	3,354,371,200
“ wasted at the dam,	7,358,539,600
“ “ “ conduit waste-weir,	1,005,940,000
“ “ “ fish-way,	350,000,000
	<hr/>
	12,068,850,800
Less quantity due to fall of lake,	28,672,900
	<hr/>
Total yield of the water-shed,	12,040,177,900
Equal to a daily yield of	32,986,800
Amount of rainfall on the water-shed,	25,251,259,000
Percentage received in the lake,	47.68

PUMPING-STATION.

The table on the next page shows the work done by the engines at the Mystic Station during the year:—

Engine No. 1 was in use 216 days, 15 hours.

“ “ 2 “ “ 239 “ 5 “ 45 minutes.

“ “ 3 “ “ 134 “ 13 “ 15 “

Total coal consumed, 7,872,100 lbs., of which 8.2 per cent. were ashes and clinkers.

Total quantity of water pumped, 3,114,371,172 gallons.

Average lift or head pumped against, 152.18 feet.

Average duty of the 3 engines, 50,211,500 ft. lbs. per 100 lbs. of coal. (No deductions.)

Quantity pumped per lb. of coal, 395.6 gallons, or, somewhat less than last year.

Evaporation in the boilers from and at 212°, as determined by meter measurement, 10.19 lbs. of water per lb. of coal.

Statement of Operations at the Mystic Pumping-Station for the year 1878.

1878.	ENGINE NO. 1.						ENGINE NO. 2.						ENGINE NO. 3.						Total amount pumped.	Daily average amount pumped	Per cent. ashes and cinders.	Quantity pumped per lb. coal.	Average lift in feet.	Duty in ft.-lbs. per 100 lbs. of total coal.	Evaporation in boilers at and from 212° per lb. of coal.
	Total pumping time.			Total amount pumped.			Total pumping time.			Total amount pumped.			Total pumping time.			Total amount pumped.									
	Total pumping time.			Total amount pumped.			Total pumping time.			Total amount pumped.			Total pumping time.			Total amount pumped.									
	Days.	Hrs.	Min.	Galls.	Days.	Hrs.	Min.	Galls.	Days.	Hrs.	Min.	Galls.	Days.	Hrs.	Min.	Galls.	Lbs.	%								Gal.	Ft.	Ft.-lbs.	Lbs.
Jan. . . .	1	2	30	5,992,284	19	20	..	91,931,314	29	17	15	222,735,360	320,718,958	10,345,773	25,610	9.4	410.4	154.31	52,814,800	10.21					
Feb. . .	2	18	30	11,609,786	13	10	45	58,716,954	27	23	..	208,151,576	278,479,316	9,945,690	24,940	9.2	398.8	153.46	51,040,200	10.14					
Mar. . .	20	9	45	90,803,850	23	6	30	106,142,128	7	16	30	56,872,448	253,818,426	8,187,691	21,529	8.8	380	151.19	47,954,100	9.83					
April . .	25	..	30	108,655,070	24	13	45	112,005,156	..	..	..	..	220,660,226	7,355,341	18,777	7.7	391.7	150.79	49,253,200	10.48	
May. . .	29	18	30	128,978,160	24	11	15	110,307,010	..	..	..	..	239,285,170	7,718,876	19,561	7.7	394.6	150.96	49,680,300	10.61	
June . .	29	11	15	130,046,032	23	4	30	120,943,148	..	..	..	..	250,989,180	8,366,306	21,233	8.4	394	151.75	49,866,700	10.26	
July . .	29	6	30	133,278,640	29	18	..	148,916,200	..	..	..	..	282,194,840	9,103,059	22,748	8.5	400.2	152.22	50,801,300	10.37	
Aug. . .	25	2	..	114,173,818	27	2	45	132,440,288	3	3	15	24,958,440	271,571,546	8,760,372	22,387	7.9	391.3	152.05	49,622,300	10.10					
Sept. . .	27	4	30	124,064,318	27	7	15	133,600,270	..	..	..	..	257,664,588	8,588,820	21,917	7.8	391.8	151.92	49,652,400	9.86	
Oct. . .	23	14	45	106,687,238	15	16	30	75,860,890	9	15	45	67,205,120	249,753,248	8,056,556	20,770	8	387.8	155.03	50,142,600	10.09					
Nov. . .	2	22	15	12,804,800	6	5	15	28,559,234	25	17	..	193,099,776	234,463,810	7,815,460	19,587	7.6	399	152.83	50,859,100	10.32					
Dec. . .	..	..	..	..	4	9	15	20,687,000	30	16	30	234,084,864	254,771,864	8,218,447	20,319	7.3	404.5	149.62	50,470,300	10.03	
Averages and Totals,	216	15	..	967,093,996	239	5	45	1,140,169,592	134	13	15	1,007,107,584	3,114,371,172	8,532,623	21,567	8.2	395.6	152.18	50,211,500	10.19					

COST OF PUMPING.

Salaries	\$7,026 37
Fuel	18,989 19
Repairs	1,185 80
Oil, waste, and packing	1,112 76
Small supplies	118 57
Total	<hr/> \$28,432 69

Cost per million gallons raised one foot high, \$0.06.

NEW FORCE MAIN.

During the year, a new force-main of 30-inch cast-iron pipe has been laid from the engine-house to the influx chamber of the Walnut-Hill reservoir; and a branch line has been laid along the foot of the outside slope of the reservoir, to connect the upper end of the main with the efflux chambers, the object of which is to permit a supply to be furnished independently of the reservoir.

It has been already used while the water was drawn out of the reservoir for examination and cleaning, and also on Christmas morning, when the outlet pipes of the reservoir were completely choked with anchor ice.

The excavation in the reservoir bank for the new main disclosed a large crack in the walls of the influx chamber, near the bottom. To avoid taking down the chamber, the discharge ends of both the old and new mains were raised, and the lower portion of the chamber, for a depth of about 7 feet, was filled with cement concrete.

A street 40 feet wide is being graded over the line of the force-mains from West street to South street, to give a more direct communication between the engine-house and reservoir.

Surveys have been made for a new location of the roadway about the reservoir; also of the reservoir basins themselves, for the purpose of calculating their capacity.

RESERVOIR, QUALITY OF WATER, CONSUMPTION, ETC.

The average monthly heights of the water in the reservoir will be found recorded in the table on page 71, also the average daily consumption of water for each month.

The water was drawn out of both basins of the reservoir last fall, and the interior lining was carefully examined. It

was found in very good condition, showing very little, if any, signs of deterioration. The west basin was thoroughly cleaned. Very little deposit was found in either basin, and what there was, was almost entirely free from offensive matter.

A sample of the mud deposit was sent to Prof. Nichols, of the Massachusetts Institute of Technology, for examination. The result of his analysis is shown by the following extracts from his report:—

The mud consisted of water	89 per cent.
Solid matter, dried at 212° Fahrenheit	11 “
	<hr/>
	100
The dried mud consisted of organic and volatile matter, including nitrogen 1.75 per cent.	23.0 “
Silica, etc., insoluble in chlorhydric acid	65.3 “
Sulphate of lime, oxide of iron, alkaline salts, etc., soluble in chlorhydric acid	11.7 “
	<hr/>
	100.0

Further, 100 parts of the wet mud, just as received, contained 0.0029 part of ammonia, also 0.0007 part of sulphur, which could be liberated as sulphuretted hydrogen by simply boiling, and 0.0019 part of sulphur, which could be liberated as sulphuretted hydrogen on boiling the mud with chlorhydric acid. These latter results might be expressed according to the common, although not strictly correct, practice by saying that 1 cubic foot of the wet mud contains, —

Free sulphuretted hydrogen	0.34 cubic inches.
Combined sulphuretted hydrogen	0.88 “

There was no appreciable quantity of nitrates, and only a very small amount of chlorides.

By an order passed Nov. 25, 1878, the Water Board was requested to report, among other things, to what extent the waters of the Mystic Lake are polluted by sewage and other objectionable matter.

The Board sent 4 samples of water, drawn from the pipes in East Boston, to Prof. Nichols, who analyzed them and obtained the following results:—

EXAMINATION OF WATER RECEIVED FROM BOSTON WATER
COMMISSIONERS.

(Results expressed in parts in 100,000.)

No.	Date received.	Unfiltered Water.		Filtered Water.		Solid Residue.		Total at 212° F.	Chlorine.
		Ammonia.	Albuminoid Ammonia.	Ammonia.	Albuminoid Ammonia.	Inorganic.	Organic and Volatile.		
1	1878. Dec. 14.	0.0093	0.0139	0.0093	0.0133	7.84	2.38	10.22	1.64
2	" "	0.0080	0.0120	0.0080	0.0120	7.26	2.42	9.68	1.82
3	" "	0.0141	0.0157	0.0141	0.0141	7.78	2.42	10.20	1.86
4	" "	0.0061	0.0115	0.0061	0.0109	8.40	2.36	10.76	1.92

Remarks. — The waters are all more strongly colored than the Cochituate as drawn in Boston. They all contain a small amount of suspended matter, which settles readily, leaving the water clear. No one of them contains enough nitrates to show in the unconcentrated water (by the sulphate of iron test).

For convenience of reference I append the mean of four samples taken at Bacon's Bridge and examined by Dr. Wood.

Jan. 13, 1873. — 0.0134, 0.0244, 8.42 2.04, 10.46, 2.02.

The average daily consumption was 8,515,768 gallons, or about $1\frac{1}{2}$ per cent. greater than in 1877, and somewhat less than in 1876. The average monthly consumption was much more uniform than is usual, as can be seen by reference to diagram B. The largest consumption for one day was on January 8, when it reached 12,732,060 gallons, and the least was on April 28, when it was 6,505,240 gallons.

MYSTIC-VALLEY SEWER.

This sewer, which was nearly completed at the date of the last report, was finished and put into service during the summer. Nearly all the tanneries, and a number of dwellings, along the line of the sewer are now drained through it, and probably all the tanneries will soon be connected.

The main sewer itself operates very satisfactorily. There have been a number of stoppages in the branch drains from the tanneries, for want of proper care in their use.

The tanneries discharge certain substances, which, if not prevented from entering the drains, adhere to the surfaces of the pipes, and soon accumulate sufficiently to interfere with, or entirely stop, the flow of the sewage.

The periodical flushing of the branch and main sewers keeps them in a clean and inoffensive condition.

For a detailed description of the sewer, see report of the City Engineer for 1878, City Doc. No. 22, 1879.

WASTE.

Little can be added to what has been written in former years upon this subject by the various Water Boards and the Water Registrar, but its financial bearings are so important that I feel called upon to again direct attention to it.

The waste in Boston, though not so great as in a number of other cities, and in fact not so great, proportionately to the population, as it was in this city itself 15 or 20 years ago, is, nevertheless, enormous. We are now using nearly 80 gallons of water per inhabitant, and there is plenty of evidence to prove that one-half this quantity is a liberal supply for all useful purposes.

Had this fact been generally appreciated by the public 8 or 9 years ago, it is natural to suppose that the Water Board would have been granted the power and means to so control the consumption of water that the large expenditure which has just been made for an additional supply might have been postponed for a number of years longer; and, unless it be appreciated and acted upon now, heavy outlays will be required in the near future to enlarge the distributing system of the Cochituate Works, and to increase the storage capacity of the sources of the Mystic supply.

For this reason, if for no other, it merits the careful study of those to whom the management of the city finances is entrusted.

The statement which is frequently made, that on account of sanitary considerations the use of water should be unrestricted, may, perhaps, when properly qualified, be defended, but it is generally put forward to defeat any attempt to prevent leakage and unlimited waste. These result largely from the use of improper fixtures and bad plumbing. Water-closets that require a constantly running stream of water to make them even tolerable, and pipes that render the soil and walls damp by leaking and sweating, so far from promoting the public health are, on the contrary, among the enemies against which it has to contend.

It is not the intention, however, to treat now of this branch of the subject, but simply to present some statistics showing what a large proportion of the water supply is wasted, and to point out the prominent causes of waste, and the methods of prevention that have proved successful in other places.

The following quotation from the report of the commissioners [Messrs. P. T. Jackson, Nathan Hale, and James F. Baldwin], appointed in 1844 "to report the best mode and the expense of bringing the water of Long Pond into the city," will be found of interest in this connection:—

In determining the best mode of bringing the water from the proposed source to the city, it seemed to the commissioners necessary to consider the purposes for which it is to be used, and the amount of regular supply required to serve those purposes. Presuming it to be the desire of the City Council that the water proposed to be introduced into the city shall be sufficient to afford an ample supply to all the inhabitants, as well for domestic purposes as for the protection of the city against fire and for cleansing the streets, and also for various economical and manufacturing uses, — particularly the feeding of steam engines, — it seemed necessary to base their calculations on some assumed amount of population to be supplied. It is presumed that since the subject was last under the consideration of commissioners, for a similar investigation, the population of the city has increased in a ratio of not less than 25 per cent., and that the present number of inhabitants is near 110,000. It may be assumed, therefore, that by the time the proposed introduction of water into the city can be accomplished, the population will not be far from 125,000. Presuming, also, that it will not be the intention of the City Council to limit the supply of water to the wants of the existing population, and taking into view the very great and uninterrupted increase of the city, not only within the period of seven years already referred to, but for the last 50 years, in which last period the number of inhabitants has more than twice doubled, it has been deemed reasonable to assume as the basis of our computation of the amount of daily supply, such a quantity as will be sufficient for all the public, domestic, and manufacturing uses of 250,000 inhabitants; or for double the population the city may be expected to contain at the date of the completion of the proposed works.

The next question for consideration is, what measure of supply shall be assumed as sufficient to meet all the wants of this number of inhabitants. On this point your commissioners conceive it will be satisfactory to adopt the conclusion which was arrived at, after a careful inquiry into the rate of supply which had been deemed sufficient in a large number of other cities, by the commissioners who were appointed under an order of the City Council in 1837. They refer in their report to the Water Works of the city of Philadelphia as those which afforded as liberal a supply of water as those of any city within their knowledge, and they state that the quantity, as appeared from the official report of the preceding year, amounted to an average of $28\frac{1}{2}$ wine gallons to each inhabitant within the limits of the distribution. The commissioners are the more disposed to adopt this ratio as the measure of the proposed supply, because, as far as their knowledge extends, it has been generally regarded as fully sufficient. At this ratio, the supply of 250,000 inhabitants will require 7,125,000 gallons of water per day. This is equal to 950,000 cubic feet, or very nearly a regular flow of 11 cubic feet a second, through every hour of the day.

The commissioners of 1845 [Messrs. John B. Jervis and Walter R. Johnson], who made the report which led to the adoption of Long pond (Lake Cochituate) for the source of supply, enter into a somewhat lengthy discussion of the quantity of water to be provided, and finally fix upon 30 wine gallons per inhabitant as a very liberal allowance.

They say, "Other standards than the bare measure that will supply *necessities*, and more comprehensive views than those which are confined to the sale of water as *merchandise*, ought, in our judgment, to influence the decision of this

question. We do not, therefore, deem it expedient to limit the calculation of a supply designed, we presume, to be used without constraint or stint for all domestic purposes, with liberal allowances for all public objects, and with power to furnish numerous branches of industry with the means of prosecuting their respective labors — to such an amount of water as would probably be introduced by parties having no interest in its use and application beyond the amount of *rents* which it would yield.”

They did not foresee that leakage and waste would nearly treble the quantity they estimated upon, or they would have sounded a note of warning, and have insisted upon a method of distribution that would have compelled the tenant to pay for what he consumed.

Cochituate water was first supplied to the city in 1848; in 1850 the average daily consumption had reached 5,837,900 wine gallons, or about 43 gallons per inhabitant, although at that date a large proportion of the people still drew their supply from wells or from the Jamaica-pond aqueduct. In 1861 it attained the enormous rate of 100 gallons per inhabitant.

On sheet A may be found profiles of the rate of increase of the consumption and of the water-takers since 1850 in percentages of the figures of that date; also a profile of the gallons consumed per taker.¹ The same statistics in tabular form are given on page 61.

The rate of increase of takers has been quite regular, although it has been affected by annexations of new territory to the city and by the replacing of the Cochituate by the Mystic supply in East Boston. The latter event accounts for the depression of the profile line for 1870. The ratio of increase of consumption has been very irregular, and its profile bears very little relation to that of the takers.

The upper profile shows how variable has been the consumption per taker; in 1850 it was 457 gallons; in 1861 it reached a maximum of 730 gallons, and in 1871 (a year of great drought, when it became necessary to pump water into the conduit to keep up the supply) a minimum of 432 gallons; during last year it was 545 gallons. When it is considered that 275 or 300 gallons per taker, at most, are an ample supply for all useful purposes the magnitude of the waste of water will be understood.

The sudden elevation of the profile from 1859 to 1860 shows the effect of an increase of pressure in the street

¹ For each taker there are on an average at this date about 6.27 consumers and 6.8 inhabitants, counting for the latter the entire population in the territory belonging to the Cochituate supply.

mains due to the laying, in the former year, of the 40-inch supply main from Brookline reservoir to the city, and is an indication of what may be expected when another new main is laid, unless in some way the consumption is controlled.

In 1865 a system of house-to-house inspection was instituted, to detect leakage and wilful waste, the effect of which was a notable decrease in the consumption, as is clearly shown by the profile. This inspection was maintained for a number of years with more or less rigor, but as it proved annoying both to the citizens and the Water Board it has been relaxed since the introduction of the Sudbury-river water in 1872.

Special notice should be taken of the sudden rise of this profile line during last year, as it indicates a great increase of waste, and shows the present tendency.

Two profiles on Sheet B show the average monthly supply from the Cochituate Works since 1850, and from the Mystic Works since 1865. The average monthly rainfalls and temperatures are plotted upon the same sheet, that their effect upon the consumption may be studied.

The Cochituate profile shows, of course, the same general features as Sheet A. The consumption has been very irregular, and has increased from a little over 15,000,000 gallons per day, in 1872, to 23,200,000 in 1878, or more than 50 per cent. in 6 years. During those years, Dorchester, West Roxbury, and Brighton, with a population of 33,771 people (census of 1875), were annexed.

What is to be more particularly noticed in both these profiles as bearing upon the subject of preventable waste is, that the consumption during the winter months is far above the average, although during those months the use of water for what may be termed legitimate purposes should be less than in any other portion of the year, as is shown by the profile for 1850 and the winters of 1857-'58, 1869-'70, and others.

The Cochituate profile shows that, in the summer months, especially when the rainfall is light, the consumption again rises high above the average, although, at that season, a large percentage of the water-takers are out of town. (Compare the profile for these months in 1853, '59, '66, and '77 with that for 1850, '60, '69, '70, '71, etc.)

The elevations in the profiles which record the above facts are a measure of the *deliberate waste* of water; those for the winter months measure the waste to prevent freezing, or, in other words, measure the effect of badly planned plumbing; those for the summer season measure, less accurately, the waste through hand-hose, faulty water-closets, and from a variety of causes of less importance.

It should be noted that the average daily consumption during last January was 28,400,000 gallons, or about 100 gallons per person.

On Sheet C is drawn a similar profile for the Highland High Service Works, which, besides exhibiting the same irregularities of consumption, shows how rapid has been its increase in the last few years. From 1875 to 1878, 3 years, it has increased 63 per cent., while the increase in consumers has been only about 35 per cent.

Profiles of the hourly consumption afford still stronger evidence that the high rate of daily consumption is very largely due to preventable waste. On Sheet D will be found a diagram showing the hourly consumption, per consumer, of water from the Cochituate, Mystic, and High-Service Works for one day in January, and another in April of this year. The corresponding table is printed on page 62. The data for the preparation of these profiles were taken with great care, and may be relied upon for accuracy.

They are plotted upon Sheet E, in percentages of the average daily consumption; and, for comparison, similar profiles of the hourly consumption in Fall River and St. Louis, on specified days, are drawn upon the same sheet.¹

From these profiles it appears that the quantity of water used and wasted in the night hours is a very large percentage of the average for the day, especially in the winter time.

Thus the profiles show the consumption of the Mystic Works from midnight to 4 A.M. of Jan. 22d to have been 96 per cent. of the hourly average for the day; that of the Cochituate Works, 90 per cent.; and that of the High-Service Works, 88 per cent. Of course, during those hours, the consumption of water for proper and useful purposes must have been comparatively slight.²

A comparison of the total revenue with the amount received for metered water, besides showing the injustice of the present system of water-rates, also illustrates how great is the amount of water wasted.

In 1878, the meter rates were $2\frac{1}{2}$ cents per 100 gallons. The total receipts from water furnished from the Cochituate Works in that year were \$945,329.96; the total consumption was 8,490,072,900 gallons; therefore the amount received for each 100 gallons was $1\frac{11}{100}$ cents, or less than half the meter rates.

¹ In St. Louis no attempt is made to check waste; in Fall River, meters are in quite general use.

² The supply from the Mystic Works, in severe weather, is sometimes greater on Sundays than on the other days of the week, the water being allowed to run freely in the buildings that are closed on that day, to prevent freezing.

The rates for domestic supply were based upon a much higher price than $2\frac{1}{2}$ cents per hundred gallons; but in connection with the rest of the unmetered supply, they average but $\frac{96}{100}$ of a cent for that quantity of water.

Had the city received in that year $2\frac{1}{2}$ cents for all the water furnished, the revenue would have been \$2,122,500, instead of \$945,329.96.

The principal causes of waste have been well stated by Mr. W. F. Davis, Water Registrar, in his special report to the Water Board, made in 1873. (See City Doc. No. 134, 1874.) He says:—

The permanent, serious, and continual causes of waste of Cochituate water are through the use of hopper water-closets; the so-called self-acting closets; urinals which are constructed for a continual run of water; the use of hand-hose for the purpose of irrigation; bad plumbing materials, and bad plumbing work; and the steady run of water which is suffered in winter-time to prevent freezing. . . .

HOPPER WATER-CLOSETS.

January 1, 1873, there were 16,137 of the different styles of these "hoppers" located within the premises of water-takers. They are found in all classes of houses. In the best ones they are usually situated in the area under the sidewalk, or in back premises, exposed to frost, for the use of servants. The water is turned on, in general, by turning a crank, whereupon the water runs until turned off; and this turning off is precisely what is omitted; because, totally unlike the pan-closet, — which must of necessity close when the hand is removed, — the water in the "hopper" flows on until the specific operation of turning the crank again is performed, which is very apt to be inadvertently, negligently, or wilfully left undone.

SELF-ACTING WATER-CLOSETS.

Under this head are 209 self-acting closets; that is to say, by opening a door, or by seat-pressure. These allow a flow of water only when in use, consequently the liability to their being left open is less than with the plain hopper; but they require a much larger quantity of water than either the pan, or self-closing, closet. For instance, a family of 7 persons, each one using the self-acting closet 5 minutes a day, thus, 209 closets, calls for 36,575 gallons daily; while the same service by pan, or self-closing, closets would call for but 5,872 gallons, or, a saving in favor of the "pan, or self-closing," of 30,723 gallons per day.

The manifest economy of the pan, or self-closing, closets over the "hopper" is still more forcibly shown from the following cases, which the introduction of a meter measurement has enabled the department to set forth accurately.

Case No. 1.

	Gallons.
Where there were 5 hopper-closets supplied, in 12 months they consumed	1,088,750
By substituting pan-closets for these, the consumption for the same length of time was reduced to	384,831
Amount saved	703,919

Case No. 2.

	Gallons.
Where there were 3 hopper-closets supplied, in 12 months they consumed	1,255,470
By substituting pan-closets for these, the consumption for the same length of time was reduced to	19,859
Amount saved	1,235,611

Case No. 3.

	Gallons.
Where there was 1 hopper-closet supplied, in 12 months it consumed	554,780
By substituting a pan-closet, the consumption for the same time was reduced to	100,572
Amount saved	454,208

Case No. 4.

	Gallons.
Where there were 3 hopper-closets supplied, in 12 months they consumed	494,180
By substituting 6 pans for the 3 hoppers, for the same length of time, the consumption was reduced to	113,774
Amount saved	380,406

Case No. 5.

	Gallons.
Where there was 1 hopper-closet supplied, in 12 months it consumed	554,800
By substituting 1 self-closing closet, for the same length of time, the consumption was reduced to	79,205
Amount saved	475,595

The result of the above 5 cases shows, in 13 closets alone, a total saving of 3,249,739 gallons a year, or a daily saving of 685 gallons for each closet, at the same time affording all the needed service. In these cases, meters are attached, and the water is doubtless shut off at night, showing, in part, that the great waste was in the working hours of the day. But for the meter, which compels the consumer to pay for all the water wasted as well as used, the estimate of loss above given would be more than doubled. Now, take the whole number of hopper-closets, *i.e.*, 16,137, and assume what experience has shown to be within the actual fact, namely, that 1 closet in 5 is wasting water in the same ratio as the five cases cited, and the total waste will exhibit the amazing aggregate of 2,210,360 gallons in every 24 hours.

URINALS.

There are 2,152 public and private urinals located within the premises of water-takers; a very large proportion of this number are in manufactories, warehouses, stores and shops; they are constructed with no reference to economy in the use of water, having, usually, a constant flow of water by a one-eighth or one-half inch stream. It may be

remarked here, that most of these urinals are constructed without reference to spreading the water over the surface of the bowl, thus allowing the salt of urine to collect, rendering the bowl nearly as filthy as if no water were used.

HAND-HOSE.

During the past summer there were 1,318 hand-hose in use by Cochituate water-takers; of this number, 638 were upon premises containing from 5,000 feet to 5 acres of land in the Roxbury and Dorchester Districts. The season was a dry one, and gardens and grass-land were freely watered by hand-hose, in a manner and *to an extent never contemplated as a use for hand-hose*; besides, the rate of charges is in no way commensurate for such service, nor should it be allowed, if paid for.

There are other descriptions of water-fixtures which are objectionable, in view of the economical use of water, but the waste by them is inconsiderable in comparison to those which are detailed above; and these can be greatly improved by attention to the last, now to be given, cause of waste, namely:—

CHEAP AND DEFECTIVE FIXTURES.

These include a class of fixtures, denominated in trade, contract work. In most low-priced houses—and it is not always confined to those—plumbing is put in to bear tolerable inspection at exposed, or readily seen parts, while elsewhere, as under the floors and partitions, the workmanship and materials used are of the poorest description; inadequate to bear water-pressure, or the occurrences which constantly threaten. Leaks presently appear, increasing more and more; then follow temporary expedients to put off thorough renewals; all the while a constant loss of water goes on. To remedy this evil, a sort of inquisitorial inspection was established a few years ago; but it became annoying to house-keepers, and it has proved inadequate to remedy so great an evil. Inspection and remedy should begin at an earlier period; early enough to prevent altogether the introduction of every kind of fixtures or plumbing-work which, in the experience of the Water Board, is liable to create waste from any cause whatever.

The yearly consumption of water from the Mystic supply has not varied much since 1876; it, however, already exceeds somewhat the capacity of the source of supply in a year of great drought, and, should it increase, it will be necessary to build a new storage-basin. Waste of water, besides greatly increasing the pumping expenses of these works, causes much inconvenience in parts of Chelsea and Somerville by lowering the pressure in the street pipes. (See City Doc. 85, 1874, pages 25–27, and Appendix B.)

The waste by the consumers in the high-service districts adds largely to the cost of pumping their supply, and if the present rate of increase of consumption with the disproportionate use of water in the winter months is not materially lessened, new works must soon be commenced. (See City Doc. No. 117, 1875.)

The effect of the large consumption from the Cochituate low-service works is to very seriously reduce the pressure in the pipes throughout the low-service districts, and in consequence to make it impossible to draw a full supply in the upper stories of the higher buildings. During the past winter complaints of an inadequate supply were often heard, and a number of applications were made for an extension of the high-service pipes to remedy the trouble. The loss of head in January and February in the 30-inch distributing main at Beacon-Hill reservoir was 30 feet during the hours of greatest consumption, and the least loss in the night hours was 14 feet. With the coming of warmer weather the greatest day loss has fallen to 20 feet, and the least night loss to 6 feet.

To restore the pressure in the pipes either the consumption must be reduced or a new distributing main be laid from Chestnut-Hill reservoir. (See City Doc. No. 117, 1875; also No. 30, 1879, page 4.)

If the present policy of allowing unrestricted use and waste of water is to continue, it will be necessary to make the above-mentioned extensions of works at an early day, and, when made, the need of other extensions would undoubtedly soon be felt.

There is another point of great importance to be considered. A system of intercepting sewers is now building to collect the city sewage and convey it to Moon Island, where it is to be discharged only during the first two hours of ebb tide. To effect this purpose it is necessary to pump all the sewage and to build reservoirs to store it during a tide. The water that is wasted is received into the sewers, and its effect will be to greatly increase the first cost of the intercepting works and the cost of operating them. If all waste could be stopped the reservoirs, estimated to cost \$431,000, could be reduced nearly one-half in size.

Three methods of limiting or preventing waste have been adopted or proposed in various cities:—

First,—The rigid enforcement of ordinances prescribing the class of fixtures that may be used, and requiring the plumbing of buildings to be done under competent inspection.

It is evident that had this city, from the earliest introduction of the Cochituate water, required that all the plumbing should be so planned that the water could be completely drawn from the pipes on nights when it is liable to freeze; that the weight and size of the pipes should be proportioned to the uses they were to serve; that the discharge end of all overflow pipes from cisterns should be in plain sight, — over the kitchen sink, for instance, — and had the use of any form

of water-closet other than those which measure out the water in the exact quantities needed for cleansing the bowl and flushing the drain-pipe, been prohibited, the waste of water would have been a matter of very much less moment than it now is, and *millions* of expenditure would have been saved. (See report of the Cochituate Water Board for 1856, City Doc. No. 12, 1857, pp. 11-13.)

Second,—Thorough house-to-house inspection, to discover faulty fixtures and to detect waste from whatever source it may arise.

The good effect of this method, even when imperfectly carried out, is illustrated on Sheet B. by the sudden dropping of the Cochituate profile in 1864, and it would have been much more marked had there been easily accessible shut-off cocks on the service pipes, by which waste in the night hours could have been readily detected.

In the report of the Water Board for 1865 it is stated that the number of notices issued for leaks from January, 1865, to May 1, 1866, was 9,555, and that the number of persons fined for waste was 3,093. The number of water-takers at the beginning of 1866 was 27,489. (See also Water Board reports for 1854, pp. 7-9; for 1864, p. 8; for 1866, p. 8.)

When district waste-meters, to record the work of the inspectors and measure its effect, are used in connection with day and night inspection the best of results may be obtained and at a moderate cost.

Mr. Deacon, City Engineer of Liverpool, England, has invented a very excellent meter for this purpose, and has applied it with wonderful success in that city. A description of it and of the manner of using it, and a statement of the results obtained with it, may be found in two papers by Mr. Deacon, appended to the annual report for 1874 of Mr. Davis, Water Registrar. (See City Document, No. 55, 1874, pp. 84-112.)

The following table, taken from one of Mr. Deacon's papers shows what may be accomplished by faithfully carrying out this method. The quantities are given in imperial gallons, which are about 20 per cent., or $\frac{1}{5}$, larger than the U. S. standard gallons : —

No. DISTRICT.	Population.	Former inter- mittent supply.	Former con- stant supply.	Present con- stant supply. Average for week ending 17th Nov.
		<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>
1. Henry Edward st. .	2,134	18	35	6 6
2. Charters st.	2,285	14½	24	13.66
3. Hatton Garden . .	2,574	23	40	19.19
4. Bispham st.	1,540	11½	19	13.37
5. Cockspur st.	967	22¼	38½	14.39
6. Gascoyne st.	1,534	18½	33	11.46
7. Plumbe st.	2,570	31	55	17.28
8. Leeds st.	827	17¼	45	13.51
9. Banastre st.	1,824	14½	26	10.27
10. Midghall st.	1,826	20¼	29	10.77
11. Burlington st.	5,798	18½	28	12.85
12. St. Paul sq.	899	24¼	37	17.54
13. Harrison st.	3,399	18½	33	12.77
14. Paul st.	838	24	41	10.74
Average		19.59	33.55	13.32

A recent pamphlet by him on this subject contains the following : —

The rate of supply for domestic purposes under high pressure and constant service is now much less (in Liverpool) than in any other water-closet town, and probably even less than in any non-water-closet town in which the system has not been applied.

In Glasgow, a water-closet city, in which the service is constant, the system has been extended to 80,000 persons, and the increased saving now amounts to 28 gallons per head per day.

In Carlisle, another water-closet city, with a constant supply, the system, where worked, shows after a few months a reduction from 36 to 20 gallons per head per day, including all water supplied for trades and public purposes.

In Chorley, a cotton manufacturing town in which water-closets are less numerous, and in which a constant supply is given, the system has been applied to the whole population (18,300), and has reduced the demand from 16 to 10 gallons per head per day for all purposes, and from 13 to 6.8 gallons, excluding only the water sold by meter to manufacturers.

In Prescott (7,000) the total rate of constant supply under the same system is now about 8 gallons per head per day.

Water will always be used much more freely here than in any of the English cities or towns mentioned above; prob-

ably it will not be considered desirable to attempt to reduce the consumption in Boston below 40 or 45 gallons per head, for all purposes.

The third method of preventing waste is the application of meters to the service pipes; or, in other words, the sale of water by meter measurement. The effectiveness of this method is beyond question; but there are many serious objections to its general application, especially in large cities and to old works. It is not worth while at this time to enumerate these objections, nor to discuss the manner of overcoming them. Undoubtedly meters can with benefit be used much more extensively than they now are, especially in the high-service districts, where the consumption per capita is much greater than in other parts of the city.

On Sheet F will be found a diagram showing the daily average consumption of water per consumer for several American cities. The figures from which it is drawn are given in the table on page 62.

In Providence and Fall River meters are quite generally used, and it will be noticed that the consumption there is quite small, — about 40 gallons per consumer.

Providence, with 8,122 service-pipes, has 3,648 meters in use, and in Fall River 52 per cent. of the service-pipes are metered.

In Cambridge, where a system of inspection, more particularly directed to the discovery of leaks in the street and service-pipes than to the detection of wilful waste, is maintained, the consumption is about 50 gallons per consumer.

The following table contains statistics that will be found interesting in connection with this subject. It has been compiled with care from the statistics given in the annual reports of the various cities, but does not claim to be accurate: —

WATER WORKS STATISTICS.

City.	Year.	Population.	Daily average consumption, Gallons.	Consumption per head, Gallons.	Number of services.	Consumption per service, Gallons.	Total income received for use of water.	Receipts per million gallons consumed.	Receipts per million gallons, Income from hydrants, only.	Receipts per mile of pipe.	Miles of pipe.	Per centage of pipe 6 in. and under.	Number of meters.	Consumption per mile of pipe, Gallons.	Remarks.
Providence	1877	100,000	2,500,800	25	7,420	337	\$200,039 39	\$219 20	\$184 00	\$1,339 20	144	62	3,203	17,367	\$30 each for hydrants.
Lowell	"	50,000	1,631,360	33	4,423	369	96,103 81	161 40	140 30	1,750 50	54.9	. . . .	229	29,720	\$20 "
Cambridge	"	48,000	2,631,730	55	6,956†	378	154,843 59	†161 40	154 40	. . . . .	. . . . .	. . . .	118	. . . .	\$11 "
Lynn	"	32,600	1,101,800	34	3,667	300	63,804 75	†158 60	133 80	1,236 40	49.6	. . . .	103	22,213	\$10,000 rec'd for hydrants.
Fall River	"	45,000	1,173,000	26	2,060	570	56,814 20	132 60	. . . .	1,173 80	48.4	39	881	24,248	{ \$20,000 received for by- drants and public bldgs.
Boston, Cohituate Wks	"	280,000	20,675,500	74	46,470	445	948,925 45	†125 75	117 15	3,163 10	300.	53	1,079	68,912	\$18 each for hydrants.
Lawrence	"	35,000	1,554,060	44	2,443	636	65,112 98	*114 80	114 80	1,703 40	36.8	45	89	42,230	"
Boston { Cohituate and Mystic Works	"	390,000	29,059,800	74	65,200	446	1,234,301 77	†116 40	108 90	2,616 10	472.	59	1,264	61,567	\$18 "
Montreal	"	130,000	8,973,500	69	24,658	364	349,083 67	107 00	. . . .	2,701 90	129.2	. . . .	368	69,502	"
Boston, Mystic Works	"	110,000	8,386,260	76	18,750	448	255,876 32	†93 40	88 20	1,662 10	172.	67	185	48,757	\$18 "
Brooklyn	"	485,000	30,342,000	63	54,879	553	1,005,842 14	*90 90	90 90	2,973 20	338.3	65	930	89,692	"
Cincinnati	"	280,000	15,945,210	57	20,000	797	461,257 15	79 25	. . . .	. . . . .	. . . . .	. . . .	304	. . . .	{ \$36,000 for hydrants. \$19,000 for other city uses.
Toronto	"	75,000	5,776,750	77	3,814	1,515	152,345 22	72 20	55 20	1,417 20	107.5	78	80	53,737	"
Philadelphia	"	817,500	48,984,000	58	. . . .	. . . .	1,133,041 16.	*63 30	63 30	1,595 80	710.	. . . .	16	68,992	{ No income from hydrants. " " " public buildings except schools.
St. Louis	"	400,000	22,349,443	56	16,800	1,330	494,629 74	60 60	60 60	2,673 70	185.	74	350	120,808	"
Cleveland	"	136,000	7,726,920	56	7,760	996	152,794 68	*54 20	54 20	1,414 80	108.	64	248	71,546	{ No income from hydrants. Income from public build- ings, \$1,000.
Detroit	"	110,200	11,543,120	105	18,754	615	210,288 12	49 90	49 90	1,084 00	194.	. . . .	9	59,500	"
Chicago	"	440,000	52,183,900	119	64,808	803	908,509 64	*47 70	47 70	2,137 70	425.	70	1,623	122,786	"
Columbus	1876	34,000	1,448,900	43	1,440	1,006	24,543 32	*46 50	46 50	681 80	36.	67	439	40,247	"
Buffalo	1877	135,000	11,091,200	87	6,350	1,833	139,296 90	*44 40	44 40	2,024 50	93.5	. . . .	. . .	125,040	"
Rochester	"	82,000	2,872,990	35	3,955	726	42,227 07	*40 30	40 30	521 30	81.	. . . .	82	35,469	"
Milwaukee	"	130,000	6,944,200	53	4,054	1,713	91,277 58	*36 00	36 00	1,210 60	75.4	64	6	92,098	"

* No income from public buildings or hydrants.

† Public buildings charged regular rates.

ADDITIONAL SUPPLY.

By an order of the City Council, approved Feb. 11, 1879, the City Treasurer was authorized to borrow the sum of \$350,000, to be charged to the account of "Additional Water Supply."

This, added to the sum which had been appropriated at the date of the last annual report (\$5,062,886.80), makes the total amount that the Water Board is authorized to expend for this work, \$5,412,886.80.

The amount expended to May 1, 1879, is	\$5,003,686 16
To which add percentage retained for faithful execution of contracts . . .	8,275 54
Total	<u>\$5,011,963 70</u>

Of this sum there have been expended \$695,555.01 for preliminary surveys, special investigations, temporary supply, and water and mill damages, leaving \$4,308,133.15 as the amount expended for the work, land-damages, and general expenses, covered by the preliminary estimate of 1872.

The Sudbury-river conduit was so far completed in February, 1878, that it was used at that time to convey water from Farm pond to Chestnut-Hill reservoir; during the year Sections 1 and 10, the connection with the Bradlee basin, the connecting-chamber of the two aqueducts, the iron-work for the gates and floors, and the terminal gate-house at Chestnut-Hill reservoir, have been finished; in fact, the conduit and its appertaining structures have been entirely completed, and have been placed under the charge of the Superintendent of the Western Division of the Cochituate Works.

The work connected with the various storage-basins in Framingham made good progress for the most part, but there has been unnecessary delay in some of it. Section A (the conduit between Dam 1 and Farm pond) has been completed, and all the sluice-gates pertaining to the dams are in place.

The contract work upon Dam No. 3 was finished in January, and during the preceding month the reservoir was filled with water for the first time.

Reservoir No. 1 was kept full most of the winter, but has recently been drawn down to permit work upon Dam 2.

The work contracted for during the year is as follows:—

Two highways in Ashland and Framingham, with abutments for a bridge across Sudbury river.

Raising Union street in Ashland, and rebuilding the abutments of a bridge.

Two iron-bridges for above roads.

Raising Salem street in Framingham, and constructing a bridge across Stony brook.

Timber dam in Basin No. 2, to prevent drainage of upper portion.

Excavation and filling at Park's corner, on land of Mr. Nevins.

Paving and protecting the embankments of the B. & A. R.R. in Basin No. 2.

Clearing Basins Nos. 1 and 2.

South dam on the old outlet of Farm pond.

Surface drainage ditch on the west shore of Farm pond.

Gate-house for Dam No. 1.

Gate-house for Section A.

Of the above contracts six are unfinished, but will be completed during the summer.

For the year ending Dec. 31, 1878, the average record of rainfall at five points in the Sudbury-river water-shed (Hopkinton, Westboro', Marlboro', Southboro', and Framingham), is 57.93 inches, of which 52.63 per cent. found its way to the river. The total yield of the river and Farm pond was 41,202,000,000 gallons,—equivalent to a depth of 30.488 inches over the whole drainage area, or to a daily flow of nearly 113,000,000 gallons.

For the year ending April 30, 1879, the rainfall was 51.74 inches, 53.82 per cent. of which reached the river, giving a total yield of 37,635,600,000 gallons,—equivalent to an average daily flow of 103,100,000 gallons.

On Feb. 13, 1878, the sluice-gates at the Farm-pond gate-house having been finished, the water was for the first time turned through the entire length of the new conduit to Chestnut-Hill reservoir.

During the year it was used to convey water to the reservoir as follows :—

					Gallons.
February	11 to 16, inclusive	.	.	.	148,400,000
July	5 to 13, "	.	.	.	118,200,000
August	12 to 14, "	.	.	.	96,400,000
September	25 to October 15, inclusive	.	.	.	188,100,000
October	24 to 25, inclusive	.	.	.	15,200,000
November	1 to 2, "	.	.	.	23,700,000
November	8 to 9, "	.	.	.	13,700,000

	Gallons.
November 11 to 12, inclusive . . .	42,900,000
November 22 to 24, " . . .	29,200,000
December 21 to 22, " . . .	51,000,000
December 26 to 27, " . . .	27,000,000
	<hr/>
Total, 52 days . . .	753,800,000

From January 1 to May 1 of this year it has been used 31 days, and has conveyed 889,700,000 gallons of water to the reservoir.

In 1872 a ditch passing under the Boston & Albany and Milford Branch Railroads was dug through the swamp to the south of Farm pond, to open a communication between the pond and Lake Cochituate.

This ditch has been frequently used during the past six years to supplement the natural supply to the lake, but as, upon the completion of the conduit, it was no longer needed, it was closed last season, and the railroad embankments were filled solid. This may be said to have blotted out the Temporary Supply Works.

Respectfully submitted,

JOS. P. DAVIS,
City Engineer.

A

The graph illustrates the relationship between water consumption, the number of water takers, and the average consumption per taker in London from 1850 to 1878. The left y-axis measures 'Gallons per day' (0 to 700), and the right y-axis measures 'Percentages' (0 to 300). The x-axis represents years from 1850 to 1878. The 'CONSUMPTION' line (solid) shows a steady increase from approximately 10% in 1850 to 250% in 1878. The 'PER TAKER' line (dashed) shows a sharp increase from 1850 to 1859, peaking at over 700 gallons per day, followed by a decline and then a gradual rise. The 'WATER TAKERS' line (dotted) shows a steady increase from approximately 10% in 1850 to 250% in 1878.

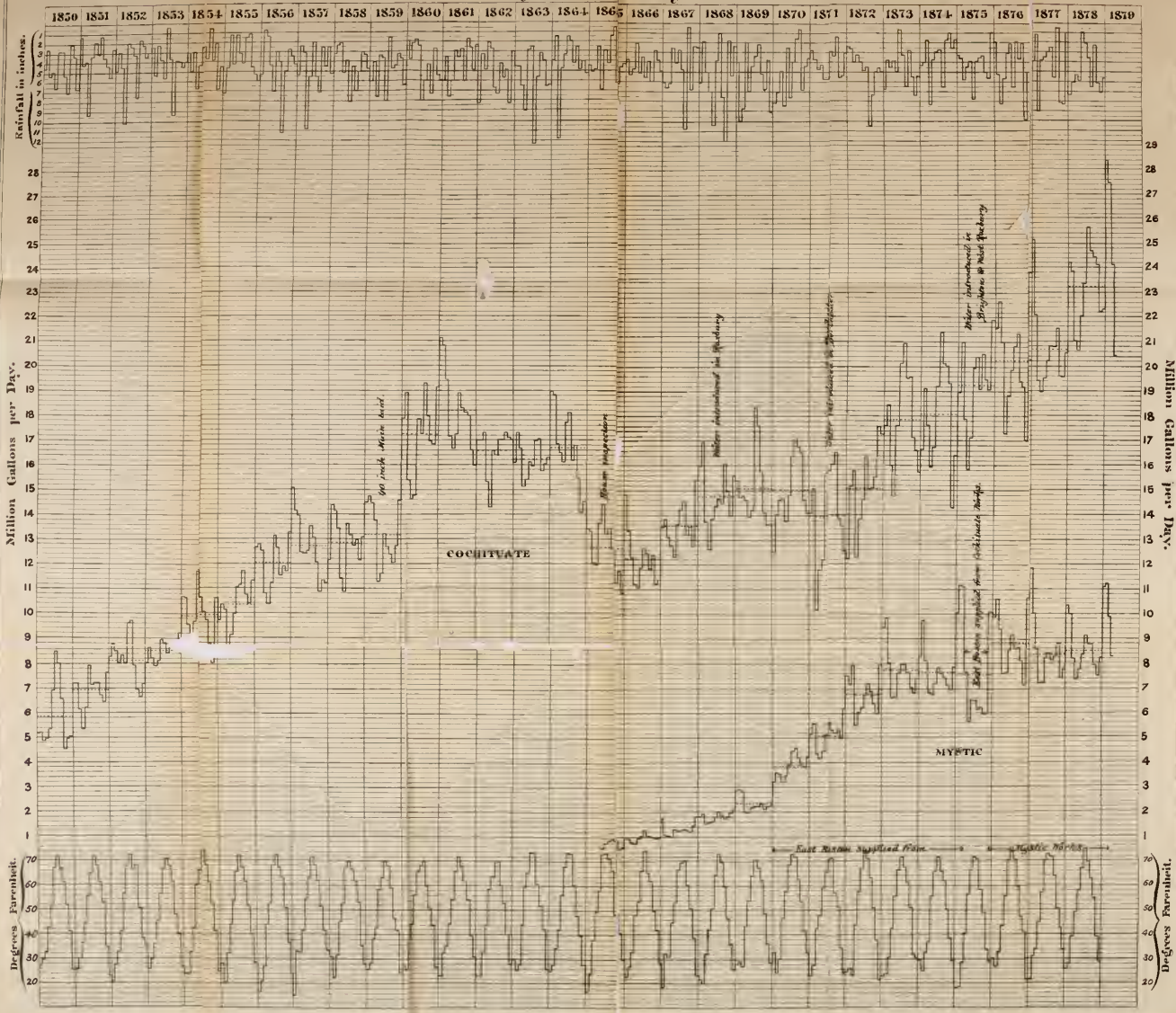
Year	Consumption (Gallons per day)	Per Taker (Gallons per day)	Water Takers (Percentage)
1850	10	150	10
1851	15	160	15
1852	20	170	20
1853	25	180	25
1854	30	190	30
1855	35	200	35
1856	40	210	40
1857	45	220	45
1858	50	230	50
1859	55	240	55
1860	60	250	60
1861	65	260	65
1862	70	270	70
1863	75	280	75
1864	80	290	80
1865	85	300	85
1866	90	310	90
1867	95	320	95
1868	100	330	100
1869	105	340	105
1870	110	350	110
1871	115	360	115
1872	120	370	120
1873	125	380	125
1874	130	390	130
1875	135	400	135
1876	140	410	140
1877	145	420	145
1878	150	430	150

Bufford's Rheotype Process East:

BOSTON WATER WORKS.

DIAGRAM showing the daily average consumption from the Cochituate and Mystic works for each month, also the monthly rainfalls and average monthly temperatures from 1850 to 1879.

The daily average for the year shown thus.....



HIGHLAND HIGH-SERVICE WORKS.

C

Diagram showing the daily average Consumption for each month, from 1870 to 1879.

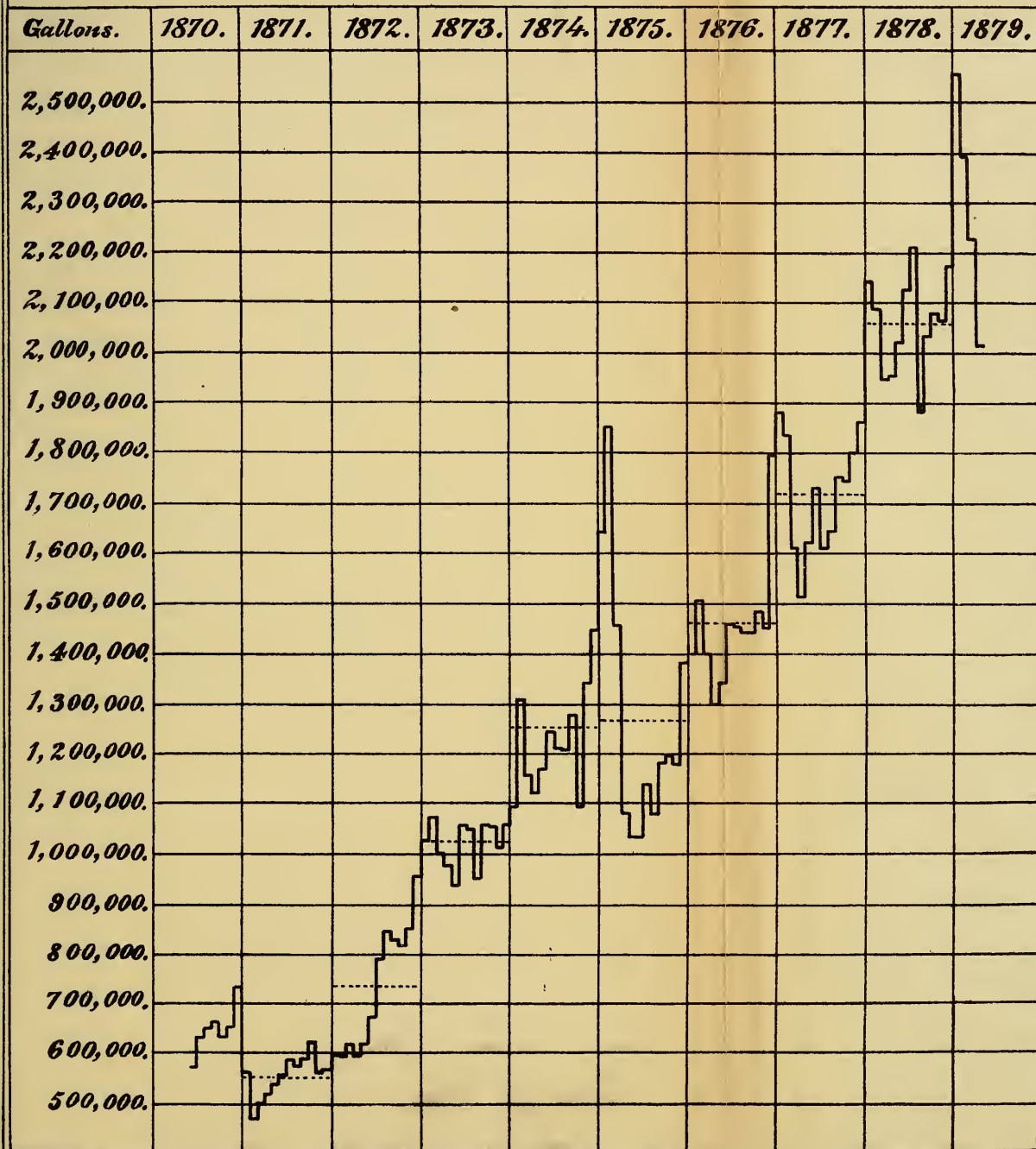
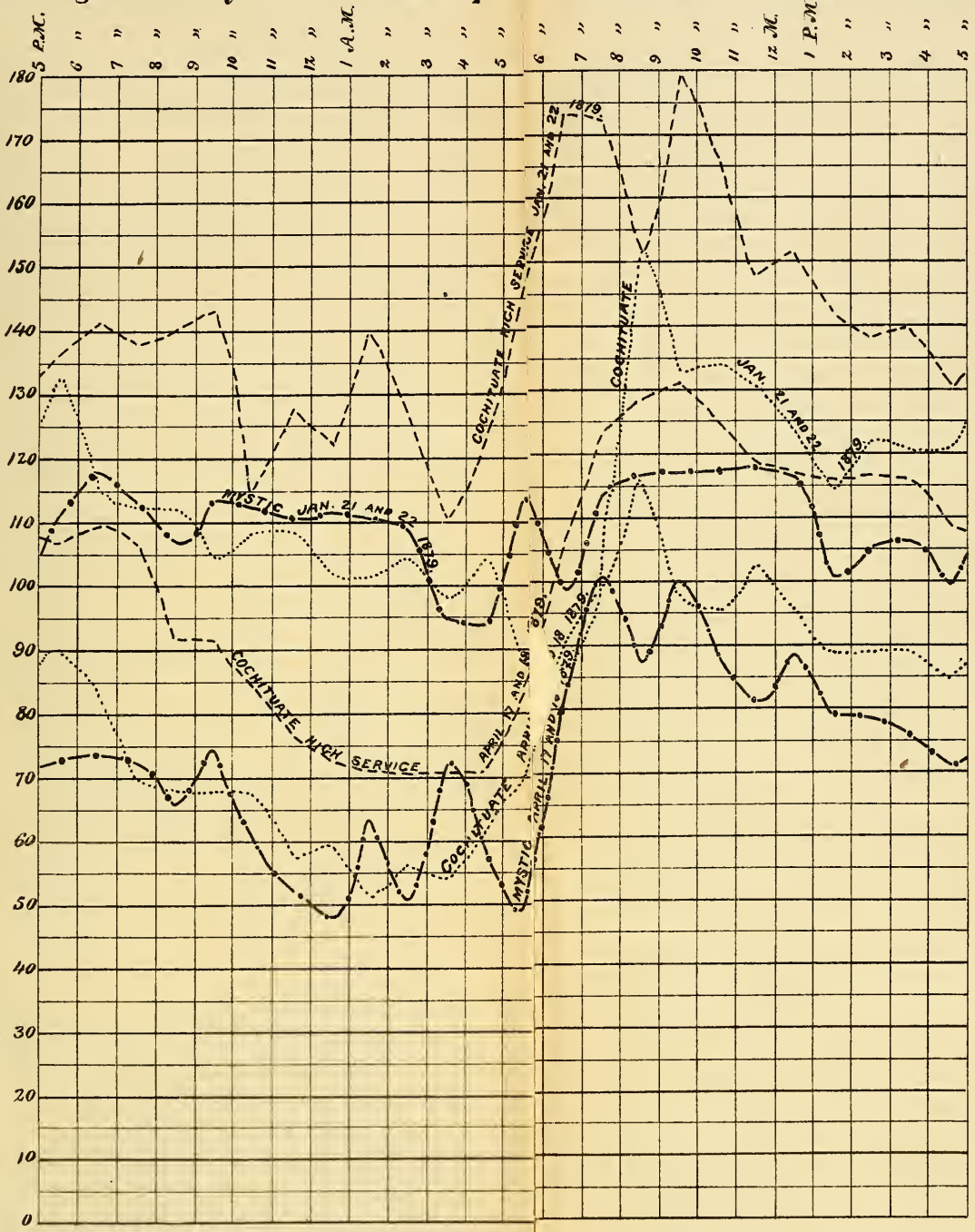


DIAGRAM.

D

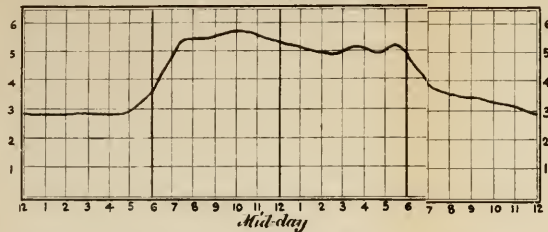
showing the hourly rate of Consumption of water per head of Consumers.



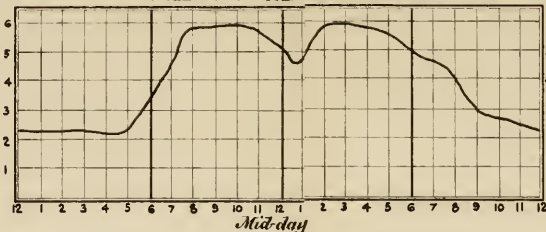
Profiles of Hourly Rate of Consumption of Water in per cents of the Daily Consumption.

E

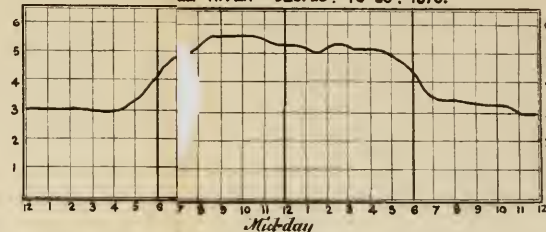
FALL RIVER FEB 4TH TO 8TH 1878.



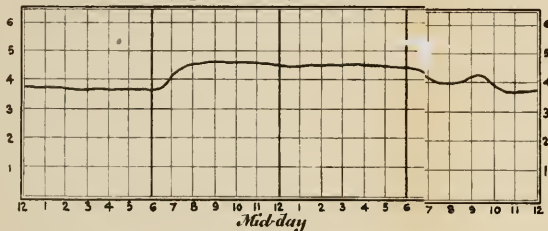
FALL RIVER JULY 16TH TO 20TH 1878.



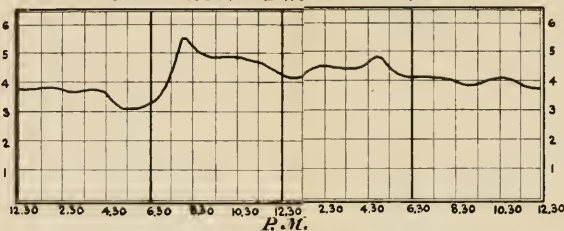
FALL RIVER DEC. 23RD TO 26TH 1878.



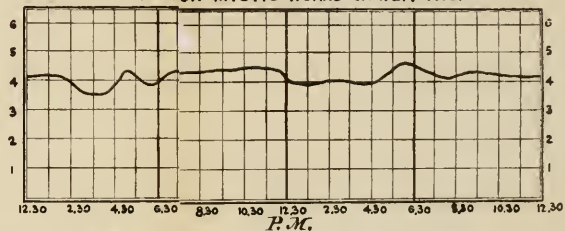
ST. LOUIS JANUARY 1879.



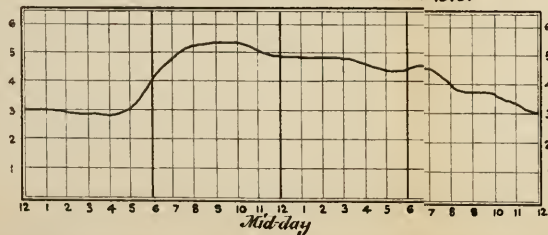
BOSTON COCHITUATE WORKS JAN. 21ST 1879.



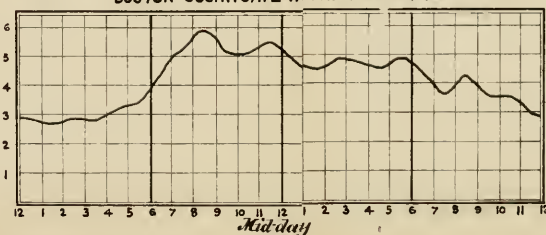
BOSTON MYSTIC WORKS JAN. 21ST 1879.



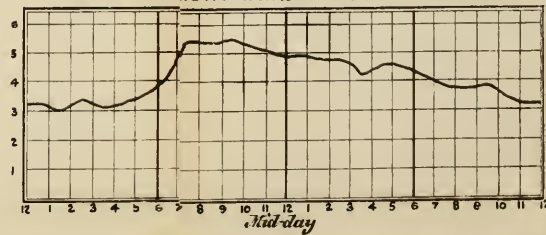
BOSTON HIGH SERVICE WORKS APR. 18TH 1879.



BOSTON COCHITUATE WORKS APR. 8TH 1879.



BOSTON MYSTIC WORKS APR. 8TH TO 15TH 1879.



DIAGRAM

F

SHOWING THE DAILY AVERAGE CONSUMPTION OF WATER PER HEAD OF CONSUMERS FROM THE CHICAGO, DETROIT, COCHITUATE HIGH-SERVICE, COCHITUATE, MYSTIC, PHILADELPHIA, BROOKLYN, CAMBRIDGE, FALL RIVER, AND PROVIDENCE WATER WORKS.

1877

1878

1879

Daily average number of Gallons per head of Consumers.

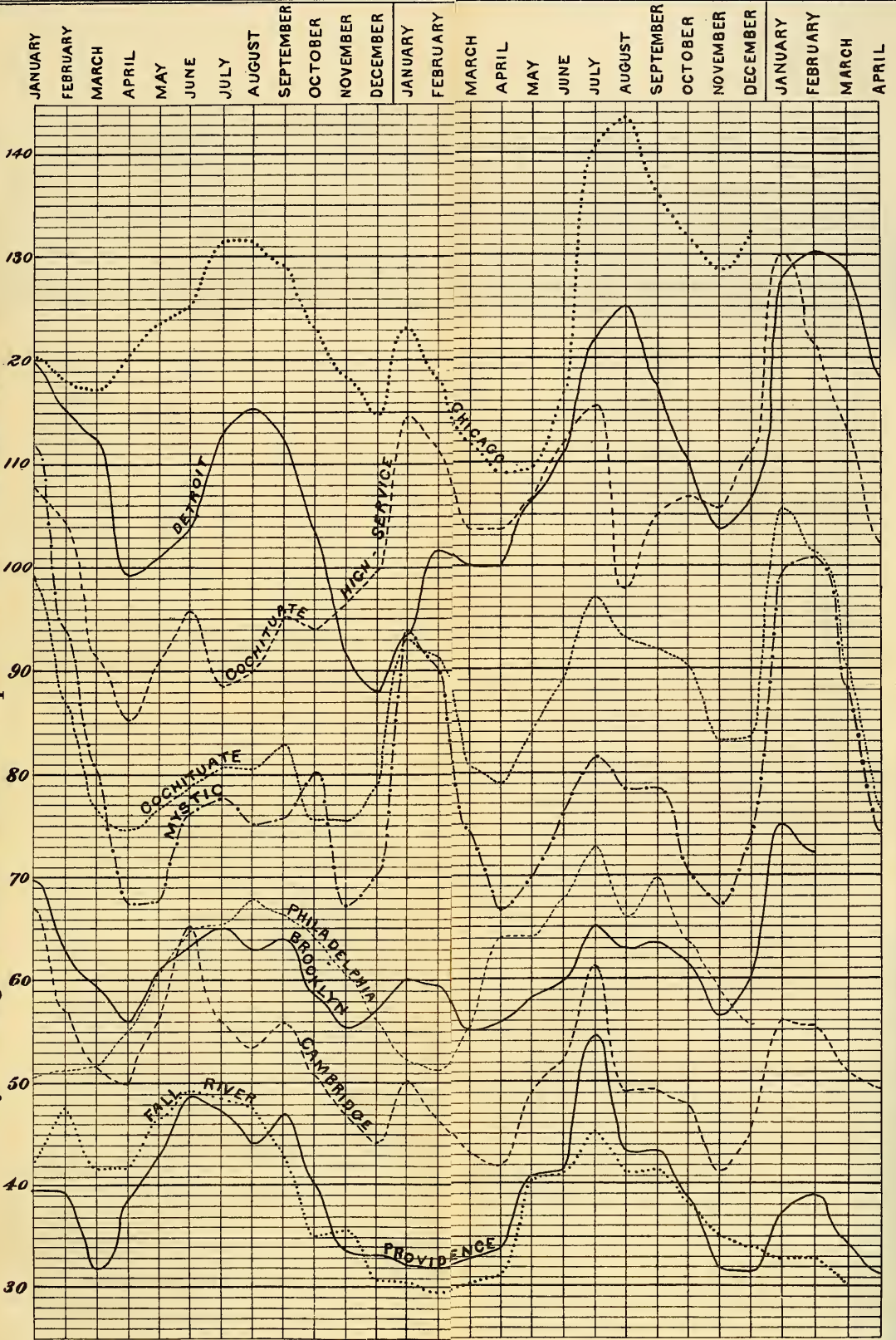


Table showing Number of Water-Takers, daily Consumption, and Percentage of Increase since 1850. Cochituate Works.

Year.	Number of takers.	Average daily Consumption.	Consumption per taker.	Per cent. increase of takers over 1850.	Per cent. increase of consumption over 1850.
1850	12,786	5,837,900	457	. . . . .	. . . . .
1851	14,770	6,883,800	466	15	18
1852	16,469	8,125,800	493	29	39
1853	17,516	8,542,300	488	37	46
1854	18,682	9,902,000	530	46	69
1855	19,596	10,346,300	528	53	77
1856	20,402	12,048,600	591	60	106
1857	21,204	12,726,000	600	66	108
1858	22,008	12,847,000	584	72	120
1859	22,843	13,175,000	577	79	126
1860	23,794	17,238,000	724	86	195
1861	24,901	18,189,300	730	95	212
1862	25,888	16,600,000	641	102	184
1863	26,570	16,238,500	611	108	178
1864	26,949	16,681,000	619	111	186
1865	27,268	12,662,000	464	113	117
1866	27,622	12,229,000	443	116	108
1867	27,929	13,565,000	486	118	132
1868	28,921	14,769,200	511	126	153
1869	30,619	15,070,400	492	140	158
1870	22,943	15,007,700	501	134	157
1871	32,308	13,945,500	432	153	139
1872	33,816	15,063,400	445	164	158
1873	35,014	17,842,700	509	174	206
1874	36,580	18,074,900	494	186	210
1875	41,000	19,267,700	470	221	230
1876	39,958	20,237,700	507	213	247
1877	41,145	20,673,500	502	222	254
1878	42,586	23,205,700	545	233	297

Hourly Consumption of Water and Amount per capita of Consumers in 24 hours, at the hourly rates, —Jan. 21-22, and April 17-18, 1879.
Quantities given in Gallons.

HOURS.	COCHITUATE WORKS.				COCHITUATE HIGH-SERVICE.				MYSTIC WORKS.			
	Hourly Consumption.		Amount per head in 24 hours, at hourly rates.		Hourly Consumption.		Amount per head in 24 hours, at hourly rates.		Hourly Consumption.		Amount per head in 24 hours, at hourly rates.	
	Jan. 21 & 22.	April 17 & 18.	January.	April.	Jan. 21 & 22.	April 17 & 18.	January.	April.	Jan. 21 & 22.	April 17 & 18.	January.	April.
5 to 6 P.M.	1,469,450	1,002,730	132.4	90.3	111,840	87,730	136.4	107.	514,080	340,118	110.1	72.8
6 to 7 "	1,234,130	929,450	115.7	83.6	115,710	90,210	141.1	110.	550,670	344,214	118.	73.7
7 to 8 "	1,246,000	770,520	112.3	69.4	113,370	87,730	138.3	107.	527,640	339,605	113.	72.3
8 to 9 "	1,243,900	899,010	112.1	81.	114,890	75,640	140.1	92.2	498,730	306,901	106.8	65.7
9 to 10 "	1,157,050	754,050	104.2	67.9	117,210	73,175	142.9	91.7	529,740	347,648	113.4	74.4
10 to 11 "	1,204,900	748,110	108.5	67.4	94,250	69,440	115.	84.7	526,200	280,488	112.7	60.1
11 to 12 "	1,203,400	640,630	108.4	57.7	104,750	63,395	127.7	77.2	516,960	243,970	110.6	52.2
12 to 1 A.M.	1,129,000	662,400	101.7	59.7	100,580	59,385	122.7	72.4	520,920	224,154	111.5	48.
1 to 2 "	1,127,650	568,490	101.6	51.2	114,290	58,280	139.4	71.1	515,670	206,985	110.4	63.6
2 to 3 "	1,162,550	627,080	104.7	56.5	103,720	57,660	126.5	70.3	509,890	224,299	109.2	50.1
3 to 4 "	1,088,600	599,750	98.1	54.	90,640	57,660	110.5	70.3	443,520	339,613	94.9	72.7
4 to 5 "	1,159,250	684,520	104.4	61.7	100,370	58,125	122.4	70.9	438,790	274,009	93.9	58.7
5 to 6 "	976,850	773,370	88.	69.7	119,810	66,650	146.1	81.3	528,990	229,123	113.3	49.1
6 to 7 "	959,900	906,690	86.5	89.8	142,250	87,265	173.5	106.4	461,120	379,624	98.7	81.3
7 to 8 "	1,079,470	1,110,610	97.2	100.	141,420	100,905	172.5	123.1	532,250	469,712	113.9	100.6
8 to 9 "	1,686,440	1,288,460	151.9	116.1	124,330	105,555	151.6	128.7	543,580	407,599	116.4	87.3
9 to 10 "	1,476,350	1,091,030	133.	98.3	146,840	107,260	179.1	130.8	545,430	468,156	116.8	100.2
10 to 11 "	1,494,660	1,063,560	134.7	95.8	137,230	102,920	167.4	125.5	648,170	417,584	117.4	89.4
11 to 12 M.	1,449,920	1,141,040	130.6	102.8	121,420	97,495	148.1	118.9	553,500	377,655	118.5	80.9
12 to 1 P.M.	1,366,760	1,064,790	123.1	95.9	124,400	96,565	151.7	117.3	546,420	430,360	117.	89.7
1 to 2 "	1,275,120	987,450	114.9	89.	116,730	95,325	142.4	116.2	470,060	372,193	100.6	79.7
2 to 3 "	1,357,380	985,310	122.3	88.8	113,530	95,480	138.5	116.4	491,520	366,047	105.3	78.4
3 to 4 "	1,339,900	993,570	120.7	89.5	114,920	95,325	140.1	116.2	497,960	403,226	106.6	76.4
4 to 5 "	1,339,590	941,510	120.7	84.8	107,090	89,280	130.6	108.9	464,570	330,947	99.5	70.9
Totals . .	30,278,240	21,322,220	. . .	. . .	2,791,590	1,980,435	. . .	. . .	12,276,380	8,224,229	. . .	. . .
Averages .	1,261,593	888,426	113.7	80.00	116,316	82,518	141.8	100.6	511,516	342,676	109.6	73.4

*Daily average Consumption of Water in Gallons per Consumer
in various American Cities.*

	Cochituate Works, Boston.	Cochituate High-Service, Boston.	Mystic Works, Boston.	Fall River.	Providence.	Cambridge.	Philadelphia.	Brooklyn.	Chicago.	Detroit.
1877.										
January	99.3	107.6	111.9	42.2	39.5	67.2	50.6	69.8	120.1	119.8
February	87.2	104.7	94.2	47.8	39.3	57.2	51.4	62.9	118.1	115.2
March	76.7	91.6	80.9	41.8	31.8	51.9	51.7	59.5	117.2	112.5
April	74.7	85.4	67.7	41.9	38.7	49.9	55.0	55.9	120.1	99.4
May	76.6	90.9	67.8	46.5	42.7	55.8	60.6	60.8	123.6	101.1
June	78.9	96.0	76.3	49.4	48.8	65.1	64.8	63.2	125.2	104.0
July	80.9	88.7	77.6	48.7	47.5	56.0	65.2	65.3	131.6	113.1
August	80.5	89.9	75.0	47.8	44.1	53.5	68.0	62.9	131.5	115.4
September	83.0	95.2	75.7	43.5	47.2	55.9	66.6	64.2	129.3	112.3
October	75.5	93.9	80.3	35.1	40.1	50.8	64.2	58.6	123.2	103.8
November	75.3	96.4	67.4	35.7	33.6	47.0	60.6	55.3	118.4	91.7
December	79.0	99.6	70.3	30.7	33.1	44.2	56.1	57.2	114.8	88.0
Averages	80.6	95.0	78.8	41.9	40.5	54.5	59.7	61.3	122.8	106.4
1878.										
January	93.1	114.6	93.9	30.6	32.2	50.2	52.4	60.1	123.1	93.5
February	91.7	111.6	90.4	29.5	32.0	46.7	51.3	59.6	118.3	101.8
March	80.7	103.6	74.4	30.4	32.8	43.1	55.3	54.9	111.8	100.0
April	79.0	103.5	66.8	31.3	33.8	41.8	64.1	55.8	108.9	99.9
May	84.1	106.4	70.0	40.4	41.0	49.0	64.1	58.4	109.6	106.4
June	88.8	111.6	75.9	41.1	41.3	52.1	67.8	59.6	116.7	110.5
July	97.0	115.3	81.7	45.2	54.6	61.2	72.8	65.0	140.7	121.8
August	93.1	97.6	78.5	41.3	43.3	49.1	66.1	62.8	143.5	125.0
September	92.0	104.9	78.5	41.4	43.4	49.2	69.9	63.6	136.0	117.3
October	90.3	106.7	70.6	38.3	38.5	47.9	63.7	61.4	132.0	110.2
November	83.1	105.5	67.2	35.0	31.9	41.4	59.1	56.5	128.5	103.4
December	83.5	111.1	73.5	34.0	31.5	44.9	55.7	59.9	132.2	106.4
Averages	88.0	107.7	76.8	36.5	38.0	48.1	61.9	59.8	125.1	108.0
1879.										
January	105.6	130.1	99.2	32.9	37.4	56.1		74.9		128.0
February	102.8	121.7	100.5	32.8	38.8	55.6		72.4		130.2
March	90.5	113.2	88.0	30.1	34.2	51.6				128.6
April	76.5	102.1	74.3		31.5	49.9				118.2

*Average Monthly and Yearly Heights, in feet and decimals, of the Reservoirs
above "tide-marsh level," 1867-78.*

BROOKLINE.

Maximum high-water line, 124.60.

MONTH.	1867.	1868.	1869.	1870.	1871.	1872.	1873. ¹	1874.	1875.	1876.	1877.	1878.
January . .	122.00	123.29	122.58	122.83	121.89	118.64	120.46	121.06	121.41	122.09	118.16	121.03
February . .	123.12	122.79	122.64	122.60	122.54	120.48	119.86	119.52	120.17	121.86	118.16	121.31
March . . .	123.05	122.33	122.48	122.77	122.08	122.04	119.71	119.27	118.95	122.24	121.12	122.53
April . . .	123.00	123.04	122.60	122.56	122.00	122.10	121.36	119.59	121.45	123.48	122.97	122.59
May	123.07	123.04	122.77	122.75	121.79	122.29	121.84	121.70	122.84	123.08	122.72	122.59
June . . .	122.34	122.77	121.85	122.64	121.98	122.25	120.90	121.83	122.82	122.24	121.43	121.56
July	122.98	122.77	122.10	122.50	122.19	121.25	118.79	121.08	121.64	121.88	120.68	121.65
August . .	122.23	122.75	122.19	122.23	122.06	122.14	118.48	120.50	121.69	122.22	120.49	121.76
September .	122.52	122.12	122.50	122.35	121.50	123.44	119.04	118.65	122.45	122.05	119.80	118.69
October . .	122.65	122.31	122.58	122.64	119.54	122.96	119.09	117.60	122.81	122.41	119.78	122.38
November .	122.89	122.56	122.46	122.60	116.94	120.98	119.69	118.43	123.03	122.70	121.78	123.15
December .	122.37	122.00	122.92	122.50	117.71	121.06	119.71	120.17	121.38	121.09	122.48	122.82
Yearly average. }	122.69	122.65	122.48	122.58	121.02	121.63	119.91	119.96	121.72	122.28	120.80	121.84

¹ New gauge put in, with a zero point .08 of a foot higher than that of the old gauge.

CHESTNUT HILL.

Maximum high-water line, 125.00.

MONTH.	1870.	1871.	1872.	1873. ¹	1874.	1875.	1876.	1877.	1878.
January . . . .	. . .	102.00	116.90	120.76	121.32	121.79	122.86	119.99	121.66
February . . .	. . .	102.81	120.46	120.26	120.19	120.86	122.97	119.79	121.99
March . . . . .	. . .	105.19	122.29	120.11	119.95	119.90	123.14	121.61	122.91
April . . . . .	. . .	110.48	122.52	121.55	120.16	121.80	123.73	123.26	122.95
May . . . . .	. . .	116.21	122.54	122.03	121.93	123.11	123.42	123.05	122.96
June . . . . .	. . .	121.46	122.35	121.24	122.11	123.19	122.70	122.04	122.08
July . . . . .	. . .	122.40	121.77	119.65	121.50	122.13	122.26	121.19	122.18
August . . . .	. . .	122.02	122.15	119.32	121.00	122.03	122.58	121.05	122.41
September . . .	. . .	121.44	122.77	119.74	119.75	122.70	122.41	120.55	121.91
October . . . .	. . .	119.67	122.08	119.70	119.15	123.09	122.72	120.82	122.85
November . . .	100.80	117.08	122.42	120.21	119.32	123.24	123.07	122.11	123.56
December . . .	101.29	115.35	121.40	120.21	120.61	122.95	121.78	122.78	123.26
Yearly average .	101.04	114.67	121.64	120.40	120.58	122.23	122.80	121.52	122.56

¹ New gauge put in, with a zero point .18 of a foot higher than that of the old gauge.

Parker-Hill Reservoir.

Maximum High-water Line, 219.00.

Month.	1875.	1876.	1877.	1878.
January	217.81	216.29	216.49	217.58
February	216.00	215.96	215.15	217.32
March	218.00	216.69	215.76	216.80
April	217.96	216.42	216.34	217.00
May	217.96	216.58	216.11	217.13
June	214.67	216.75	216.77	217.68
July	214.71	217.02	216.81	218.07
August	216.25	216.58	215.53	217.61
September	216.19	216.62	215.61	217.52
October	216.29	215.69	216.62	217.34
November	216.29	216.12	216.46	216.88
December	215.79	215.83	217.20	217.36
Yearly average . . .	216.50	216.38	216.24	217.36

Table of the average Monthly and Yearly Heights of Water in the Lake above the bottom of the Aqueduct.

Month.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.
Jan. . .	10.16	8.06	9.53	10.75	10.80	10.83	11.93	6.09	11.33	13.88	0.41	8.37	12.14	10.29	12.27	13.25	5.29	4.23	12.53	11.54	0.52	8.98	9.36	11.41
Feb. . .	10.65	7.59	10.28	10.05	12.17	11.36	12.77	6.57	12.85	13.71	8.24	8.73	13.14	9.75	12.96	13.19	5.40	2.52	12.31	12.71	0.92	10.94	10.33	11.68
March .	10.68	6.96	10.67	9.35	12.45	12.67	13.21	8.65	13.95	14.33	12.28	10.58	13.57	10.96	13.21	12.81	7.96	1.19	12.06	12.98	6.83	11.87	12.26	12.30
April .	11.57	10.24	12.30	9.36	12.06	12.72	14.14	12.40	14.59	14.32	14.00	11.96	13.50	13.29	13.40	13.33	9.31	4.19	13.17	13.12	11.83	12.98	13.03	12.10
May . .	11.35	12.05	12.05	10.67	12.06	11.52	13.88	14.45	14.01	14.26	14.00	12.01	13.44	13.67	13.65	13.12	10.37	5.10	13.17	13.33	13.00	13.00	13.03	12.66
June . .	10.69	11.78	12.14	11.72	11.96	10.83	12.99	14.43	13.29	13.51	13.41	12.72	13.20	13.37	13.23	13.02	9.27	5.79	12.04	13.29	13.08	11.83	13.07	12.68
July . .	9.86	10.67	11.41	11.74	10.22	10.42	11.50	14.05	12.82	11.33	12.28	11.84	12.12	12.46	12.62	12.12	7.83	6.33	10.25	12.25	12.50	9.94	11.53	12.04
Aug. . .	9.01	11.59	11.70	11.30	10.24	9.42	10.27	12.97	13.73	9.65	11.18	11.79	12.17	11.70	11.04	10.37	6.27	7.04	8.87	10.94	12.67	9.92	9.55	12.15
Sept. . .	7.52	10.82	11.72	10.40	9.84	9.42	8.71	11.33	13.43	7.91	10.09	11.59	12.00	11.61	9.73	8.67	5.00	10.02	7.60	9.37	11.25	8.96	7.74	12.33
Oct. . .	6.42	10.10	11.10	8.72	10.15	10.35	7.79	10.30	12.94	6.46	9.02	11.72	11.10	11.83	10.58	8.10	3.81	11.46	7.29	7.50	10.31	8.46	8.67	11.26
Nov. . .	6.28	10.80	11.16	9.01	9.98	10.44	7.22	10.24	13.26	5.48	8.74	11.41	11.03	11.75	11.21	7.10	3.60	12.67	7.60	5.42	9.87	9.17	10.00	12.72
Dec. . .	7.29	10.97	11.02	9.85	10.54	11.17	6.88	11.70	14.06	5.41	8.48	11.68	10.51	12.33	11.77	6.40	3.83	12.40	9.08	3.60	9.67	9.54	11.25	12.54
Yearly average.	9.29	10.14	11.26	10.24	11.04	11.93	10.94	11.10	13.52	10.84	10.76	11.20	12.33	11.92	12.15	10.96	6.50	6.91	10.50	10.50	9.37	10.47	10.82	12.16

¹ High-water mark raised two feet.

Consumption of Water—Cochituate Works.

MONTH.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.
January .	18,954,000	13,412,000	14,850,000	13,511,000	15,992,000	15,426,000	12,525,000	14,110,000	12,203,900	17,639,100	16,651,300	18,978,300	21,550,200	25,129,300	24,210,600
February	18,846,000	13,318,000	13,385,000	13,831,000	16,927,000	14,731,000	14,052,000	15,070,000	15,172,000	18,461,000	19,103,850	20,991,700	22,675,200	22,071,500	23,848,700
March . .	16,841,000	12,027,000	12,284,000	13,110,000	13,722,000	14,789,000	14,646,000	10,162,000	15,788,500	15,983,700	17,657,300	17,878,100	20,931,500	19,446,600	21,019,500
April . .	16,506,000	11,975,000	11,251,000	12,770,000	12,636,000	14,650,000	14,703,000	11,814,000	12,251,000	14,781,800	15,929,600	15,852,000	17,300,500	18,988,800	20,628,300
May . . .	16,094,000	13,660,000	11,076,000	12,301,000	13,846,000	13,902,000	13,759,000	12,222,000	13,830,000	17,637,400	16,731,900	17,164,500	18,837,800	19,520,300	22,023,800
June . .	17,730,000	14,391,000	11,878,000	13,625,000	14,351,000	14,252,000	14,824,000	15,695,000	14,617,500	20,100,600	19,239,750	19,923,400	19,872,300	20,192,400	23,360,600
July . .	18,112,000	13,297,000	12,668,000	14,250,000	14,676,000	18,378,000	16,392,000	15,748,000	16,377,100	20,917,100	21,386,200	20,396,400	20,820,600	20,799,400	25,620,000
August .	16,188,000	13,426,000	12,441,000	14,546,000	14,479,000	17,632,000	17,107,000	16,019,000	15,017,900	19,544,600	20,127,800	19,085,200	21,333,900	20,778,400	24,679,600
September	16,798,000	12,624,000	11,842,000	13,186,000	16,972,000	15,741,000	16,785,000	16,512,000	15,072,500	19,572,700	20,022,600	20,497,400	19,430,800	21,499,500	24,469,700
October .	15,479,000	11,273,000	12,296,000	13,518,000	14,954,000	14,096,000	16,528,000	13,856,000	15,544,800	17,113,800	19,320,900	19,470,700	19,214,000	19,598,700	24,100,700
November	14,079,000	11,750,000	11,262,000	12,707,000	13,975,000	13,608,000	14,677,000	13,574,000	17,591,400	16,633,400	14,319,500	19,076,400	17,023,700	19,577,500	22,200,600
December	14,547,000	10,877,000	11,412,000	15,434,000	15,600,000	13,640,000	14,094,000	12,564,000	17,263,700	15,727,100	16,407,950	21,898,500	23,783,000	20,535,900	22,298,500
Average for year.	16,681,000	12,662,000	12,229,000	13,565,000	14,769,167	15,070,400	15,007,700	13,945,500	15,063,400	17,842,700	18,074,900	19,267,700	20,237,700	20,673,500	23,205,700

Statement showing Amount of Rainfall on Water-shed of Lake Cochituate; Amount of Water consumed and wasted; available Amount received into Lake; available Percentage of Rainfall, etc., from 1852 to 1878 inclusive. Water-shed of Lake = 12,077 acres.

Year.	Rainfall.	Amount of Rain-fall on Water-shed of Lake Cochituate.	Amount of Water drawn from Lake.	Amount of Water wasted from Lake.	Total Amount consumed and wasted.	Rise of Lake during the year.	Fall of Lake during the year.	Total Amount of Rainfall received into Lake.	Daily Ave'ge Am't of Rain-fall received into Lake.	Percentage of Rainfall rec'd into Lake.
	<i>Inches.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	
1852 ¹	47.93	15,759,207,000	2,974,042,800	4,020,560,885	6,994,609,685	. . . .	261,360,000	6,733,249,685	18,396,857	43 per cent.
1853	55.73	18,366,561,000	3,117,939,500	3,166,417,500	6,284,357,000	239,580,000	. . . .	6,523,937,000	17,873,800	35 per cent.
1854	48.15	14,187,562,000	3,614,230,000	4,187,733,020	7,801,963,020	. . . .	217,800,000	7,584,163,020	20,778,529	53 per cent.
1855	34.96	11,494,719,000	3,776,399,500	No acc't kept.	. . . .	. . . .	328,700,000	. . . .	. . . .	. . . .
1856	40.80	13,114,892,000	4,409,787,800	No acc't kept.	. . . .	598,950,000	. . . .	. . . .	. . . .	. . . .
1857	63.10	20,747,052,000	4,644,990,000	10,625,900,000	15,270,890,000	324,670,000	. . . .	15,303,560,000	41,927,562	74 per cent.
1858	48.66	15,999,232,000	4,689,155,000	1,934,500,000	6,623,655,000	. . . .	141,570,000	6,482,085,000	17,759,013	40 per cent.
1859 ²	49.02	16,117,602,000	4,808,875,000	7,569,000,000	12,377,875,000	283,140,000	. . . .	12,661,015,000	34,687,712	78 per cent.
1860	55.44	18,228,471,000	6,309,108,000	None.	6,309,108,000	174,240,000	. . . .	6,483,348,000	17,714,065	35 per cent.
1861	45.44	15,269,303,000	6,639,095,900	3,377,558,966	10,016,654,866	. . . .	1,459,260,000	8,557,394,866	23,444,917	56 per cent.
1862	49.69	16,337,890,000	6,059,000,000	33,200,000	6,092,200,000	1,306,800,000	. . . .	7,399,000,000	20,271,233	45 per cent.
1863	69.30	22,785,586,000	5,927,052,500	2,165,096,470	8,092,748,970	762,300,000	. . . .	8,855,048,970	24,260,408	39 per cent.
1864	42.60	14,006,726,000	6,105,306,700	1,368,746,000	7,474,052,700	. . . .	1,848,577,000	5,625,475,700	15,370,152	40 per cent.
1865	49.46	16,262,266,000	4,621,630,000	1,688,120,674	6,309,750,674	743,242,500	. . . .	7,052,993,174	19,323,270	43 per cent.
1866	62.32	20,490,456,000	4,463,685,000	None.	4,463,685,000	743,242,500	. . . .	5,206,927,500	14,265,280	25 per cent.
1867	56.25	18,494,795,000	4,551,225,000	2,482,041,000	7,433,266,000	. . . .	698,811,000	6,734,455,000	18,450,600	36 per cent.

1868	49.71	16,459,544,000	5,405,515,000	2,507,684,000	7,913,199,000	346,371,000	. . . . .	8,259,570,000	22,567,160	50 per cent.
1869	64.34	21,009,808,000	5,500,696,000	1,635,570,000	7,139,321,000	480,882,000	. . . . .	7,620,293,000	20,877,300	36 per cent.
1870	55.89	18,328,694,000	5,477,810,000	4,818,971,000	10,296,781,000	. . . . .	1,736,985,000	8,580,696,000	23,453,900	47 per cent.
1871	45.39	14,885,300,000	5,223,500,000	None.	5,223,500,000	. . . . .	250,933,000	4,972,567,000	13,623,470	33 per cent.
1872	48.47	15,895,364,000	5,775,151,200	None.	5,775,151,200	31,543,995,500	. . . . .	5,642,480,300	15,416,610	35 per cent.
1873	45.43	14,398,419,000	6,511,826,900	2,917,977,000	9,429,803,900	. . . . .	515,132,000	8,914,671,900	24,423,760	60 per cent.
1874	35.93	11,782,967,000	6,623,972,900	1,145,851,700	7,769,824,600	. . . . .	1,367,715,000	6,402,109,600	17,540,030	54 per cent.
1875	45.49	14,918,096,000	7,092,955,500	None.	7,092,955,500	31,222,885,000	. . . . .	5,760,040,500	15,780,930	39 per cent.
1876	48.49	15,901,922,500	7,277,175,200	1,619,243,800	8,896,419,000	343,438,000	. . . . .	6,411,557,000	17,517,920	40 per cent.
1877	43.80	14,363,873,100	7,626,889,200	1,494,978,600	9,111,867,800	3378,727,000	. . . . .	7,596,244,800	20,811,600	53 per cent.
1878	53.58	17,571,148,900	7,743,904,700	3,341,875,000	11,085,779,700	3219,788,000	. . . . .	8,637,267,700	23,663,700	49 per cent.
Average . 50.01		Average daily waste for 25 years 6,800,100			Average daily yield of Lake Water-shed for 25 years, 20,808,000.					45.5 per cent.

¹ Observation of rainfall at Lake Cochituate commenced 1852, and these observations are assumed as correct for the whole district.

² Lake raised two feet.

³ Amount received from Sudbury river in 1872, 1,676,686,400 gallons.

3 " " " " 1875, 2,535,800,000 "

3 " " " " 1876, 2,528,300,000 "

3 " " " " 1877, 1,894,350,000 "

3 " " " " 1878, 2,668,300,000 "

Table showing the Depths of Water in the Conduit at Gate-House, Lake Cochituate, the Number of Days it was running at those depths, and the Average Depth for each month.

1878.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total Days.
0'-0'' . . . . .	.	.	.	.	.	1	.	.	.	.	.	.	1
5'-11'' . . . . .	.	.	.	.	.	.	.	.	.	.	1	.	1
6'-8'' . . . . .	.	1	.	.	.	.	.	.	.	.	.	.	1
7'-0'' . . . . .	.	.	.	.	.	.	.	.	.	.	.	30	30
7'-1'' . . . . .	.	.	.	.	.	.	.	.	.	.	.	1	1
7'-2'' . . . . .	.	.	.	.	.	1	.	.	.	.	.	.	1
7'-6''	15	.	.	.	.	.	.	.	.	.	.	.	15
8'-0''	12	15	31	30	31	28	31	31	30	31	29	.	299
8'-6''	4	12	.	.	.	.	.	.	.	.	.	.	16
													365

Average Monthly Depths.

1878.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly Average.
	7'-9 $\frac{3}{4}$ ''	8'-2''	8'-0''	8'-0''	8'-0''	7'-8 $\frac{1}{2}$ ''	8'-0''	8'-0''	8'-0''	8'-0''	7'-11 $\frac{1}{4}$ ''	7'-0''	7'-10 $\frac{1}{4}$ ''

Observations at Mystic Lake and Reservoir.

	Height of Water in Lake above tide-marsh level. Feet.			Height of Water in Reservoir above tide- marsh level. Feet.			Average Daily Consumption. Gallons.		
	1876.	1877.	1878.	1876.	1877.	1878.	1876.	1877.	1878.
Jan.	6.71	6.40	5.94	146.35	146.34	146.39	9,896,737	11,859,854	10,325,705
Feb.	6.60	6.54	5.65	146 11	146.38	146.49	10,601,013	9,982,621	9,944,140
Mar.	6.56	6.35	5.51	146.33	146.41	146.45	9,396,910	8,578,935	8,192,825
April	6.00	6.24	6.04	146.22	146.30	146.39	7,568,052	7,200,533	7,365,951
May	6.51	6.29	6.31	146.38	146.32	146.36	7,610,317	7,250,492	7,717,476
June	5.87	6.09	6.24	146.17	146.05	146.23	8,560,937	8,190,530	8,383,667
July	3.71	5.03	4.89	146.51	146.33	146.12	9,152,492	8,371,295	9,087,658
Aug.	4.57	3.64	5.41	146.30	146.52	146.32	8,600,788	8,121,402	8,751,038
Sept.	2.54	2.48	5.22	146.43	146.20	145.36	8,619,557	8,242,180	8,767,490
Oct.	1.45	3.01	3.97	146.50	146.58	. . .	8,081,052	8,780,799	7,900,000
Nov.	3.69	6.02	5.17	146.41	146.56	. . .	7,153,629	7,396,879	7,525,957
Dec.	6.22	6.26	5.97	145.97	146.64	146.53	10,673,036	7,732,921	8,227,314
Averages,	5.04	5.36	5.53	146.31	146.39	. . .	8,825,808	8,386,257	8,515,768

High water in the lake is 7.00 feet above tide-marsh level.

“ “ reservoir is 147.00 feet above tide-marsh level.

Bottom of conduit at lake is 4.17 feet below tide-marsh level.

Reservoir emptied in October and November, 1878, for inspection and cleaning.

Statement showing Amount of Rainfall on Water-shed of Mystic Lake; amount of water consumed and wasted; available Amount received into Lake; available Percentage of Rainfall, etc., 1876 to 1878. Water-shed of Lake, 17,200 acres.

Year.	Rainfall.	Amount of Rain-fall on Water-shed of Mystic Lake.	Amount of Water drawn from Lake.	Amount of Water wasted from Lake.	Total Amount consumed and wasted.	Rise of Lake during the year.	Fall of Lake during the year.	Total Amount of Rainfall received into Lake.	Daily ave'ge am't of Rain-fall received into Lake.	Percentage of Rainfall received into Lake.
	<i>Inches.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Gallons.</i>	<i>Per cent.</i>
1876	47.00	21,951 525,000	3,230,101,300	6,369,774,700	9,599,876,000	. . . . .	32,583,000	9,567,293,000	26,140,100	43.6
1877	43.095	20,127,679,800	3,069,554,800	7,250,223,500	10,319,778,300	. . . . .	16,291,400	10,303,486,900	28,228,700	51.2
1878	54.065	25,251,255,000	3,354,371,200	8,714,479,600	12,068,850,800	. . . . .	28,672,900	12,040,177,900	32,989,800	47.7
Averages .	48.05	22,443,436,600	3,218,009,100	7,444,825,900	10,662,835,000	. . . . .	. . . . .	10,636,986,000	29,118,500	47.5

Table showing Rainfall at Lake Cochituate for the year 1878.

1878.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1		2.50							.04			
2								1.12				1.05
3 . . . . .	.02		.65									
4 . . . . .	.73							.44				.36
5 . . . . .					.03							
6								2.00	.49			
7 . . . . .				.47					.04			
8 . . . . .			.02									
9 . . . . .		.47				.92	1.44	2.00		.25		
10 . . . . .		.37					.14					
11	1.94					.22		.04			.10	2 48
12 . . . . .			.12	.52		.02	.04		.21	2.48		
13			1.34			.20		.17	.10			
14	1.16		.06									
15 . . . . .			.02									
16 . . . . .								.60				.23
17 . . . . .						.22	.02					
18 . . . . .		.19	1.52					.08			2.90	
19												
20 . . . . .					.07						.26	
21 . . . . .				.04			.52					.98
22 . . . . .	.58	2.40				1.53		.04			1.44	
23 . . . . .	.06			.35						1.92		
24 . . . . .			.12									
25 . . . . .						.05		.45				
26 . . . . .	.83				.05				.24		.04	
27 . . . . .			.02			.12	.17					
28 . . . . .	.45										1.35	.02
29 . . . . .			.33		.03							
30				4.25								
31 . . . . .					.65		1.14			.50		
Totals .	5.77	5.93	4.20	5.63	.83	3.33	3.47	6.94	1.12	5.15	6.09	5.12

Total for the year 53.58 inches.

Table showing Rainfall at Mystic Lake for the year 1878.

1878.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1. . . . .	...	2.18	...	...	...	...	...	.04	...	...	...	...
2. . . . .	...	...	...	...	...	...	...	.11	1.51	...	...	.87
3. . . . .	...	...	.60	...	...	...	...	.36	...	...	...	...
4. . . . .	.70	...	...	...	...	...	...	.41	.21	...	...	.19
5. . . . .	...	...	...	.18	.03	...	...	...	...	...	...	...
6. . . . .	...	...	...	...	...	...	...	2.75	...	...	...	...
7. . . . .	...	...	.03	.32	...	...	...	.17	.11	...	.01	...
8. . . . .	...	...	...	...	...	.71	...	1.02	...	...	...	...
9. . . . .	...	.37	...	...	...	.22	.28	1.74	...	.35	...	.67
10. . . . .	...	.45	...	...	...	...	.58	...	...	...	...	1.64
11.	1.83	...	...	...	...	...	.14	.02	.18	...	.08	...
12. . . . .	.10	...	...	.65	...	.38	.14	...	.70	2.18	...	...
13. . . . .	...	...	1.31	...	...	.04	...	...	.04	...	.01	...
14. . . . .	.93	...	...	...	...	...	.06	...	...	...	...	...
15. . . . .	...	...	...	...	...	...	...	...	...	...	...	.21
16. . . . .	...	...	...	...	...	...	...	...	...	...	...	...
17. . . . .	...	.28	...	...	...	.29	.05	.34	...	...	.65	...
18. . . . .	...	...	1.59	...	...	...	...	.01	...	...	1.86	...
19. . . . .	...	...	...	...	...	...	...	...	...	...	...	...
20. . . . .	...	...	...	...	.07	...	...	...	...	...	.25	...
21. . . . .	.59	...	...	...	.01	...	1.04	...	...	...	...	1.05
22. . . . .	...	2.44	...	...	...	.92	...	.05	...	...	1.48	...
23. . . . .	.10	...	...	.44	...	.03	...	...	...	1.67	...	...
24. . . . .	...	...	.08	...	...	.08	...	...	...	...	.01	...
25. . . . .	...	...	...	...	...	...	...	.55	...	...	.05	...
26.	1.01	...	...	.57	.11	...	...	...	.37	...	...	...
27. . . . .	...	...	...	.47	...	...	.10	...	...	...	1.07	...
28. . . . .	.41	...	...	.80	...	...	.07	...	...	...	.14	...
29. . . . .	...	...	.25	.63	...	...	...	...	...	...	...	...
30. . . . .	...	...	...	1.63	...	...	.19	...	...	.53	...	...
31. . . . .	...	...	...	...	.47	...	1.01	...	...	.03	...	...
Totals .	5.67	5.72	3.86	5.69	.69	2.67	3.66	7.57	3.12	4.76	5.61	4.65

Total for the year 53.67 inches.

Table showing the Rainfall (in inches and hundredths) at Various Places in Eastern Massachusetts, for the year 1878.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Lake Cochituate	5.77	5.93	4.20	5.63	0.83	3.33	3.47	6.94	1.12	5.15	6.09	5.12	53.58
Framingham	6.06	4.56	4.46	5.41	0.92	3.79	3.14	7.15	1.00	5.27	6.33	6.27	54.36
Southboro'	5.255	6.705	4.79	5.97	0.95	4.04	2.80	7.56	1.54	6.66	7.36	6.19	59.85
Marlboro'	5.985	5.70	4.975	6.55	0.91	4.08	3.255	7.535	1.535	7.275	7.49	6.635	61.805
Westboro'	5.40	6.12	4.49	5.30	0.99	3.53	2.86	6.40	1.15	6.19	6.97	6.10	55.59
Hopkinton	5.53	6.78	4.73	5.72	1.01	3.98	2.73	6.30	1.23	6.60	6.97	6.64	58.31
Chestnut Hill Reservoir	5.97	6.96	4.63	5.95	0.79	2.21	3.34	5.03	2.53	5.29	7.29	4.76	55.05
Waltham (Boston Manufacturing Co.)	5.35	4.03	4.07	5.11	0.62	2.20	6.15	10.91	1.67	5.03	6.03	4.08	55.25
Cambridge (Observatory)	5.84	6.59	4.17	5.15	0.87	2.68	4.82	6.21	2.24	5.04	6.52	4.39	54.54
Lowell (Locks and Canals Co.)	5.28	5.51	4.35	8.14	0.59	3.05	2.19	10.77	0.89	5.33	6.71	5.92	58.58
Lowell (Merrimack Co.)	4.62	5.03	3.80	8.88	0.30	3.14	2.16	10.73	0.78	5.01	6.09	6.04	56.63
Mystic Lake	5.07	5.72	3.86	5.69	0.69	2.67	3.66	7.57	3.12	4.76	5.61	4.65	53.67
Mystic Engine-house	5.785	6.00	3.81	5.57	0.78	2.57	3.855	8.53	2.47	4.91	5.73	4.87	54.88
Mystic Station	5.67	5.75	4.01	5.76	0.66	2.56	3.39	7.44	3.27	5.13	5.78	5.04	54.46
Beacon Hill Reservoir	5.52	5.51	4.59	5.77	0.83	2.03	4.34	6.60	2.12	5.19	6.32	4.87	53.69
Boston (Supt. of Sewers)	7.30	6.08	5.37	5.88	0.92	2.06	3.63	6.50	2.32	6.10	7.11	5.62	58.89
Boston (U. S. Signal Service)	7.60	4.40	5.91	6.14	1.03	2.28	4.58	7.66	3.47	6.76	8.94	6.76	65.63
Averages	5.80	5.73	4.50	6.04	0.80	2.96	3.56	7.64	1.91	5.64	6.67	5.53	56.745

WATER REGISTRAR'S REPORT, 1879.

OFFICE OF THE WATER REGISTRAR,

CITY HALL, BOSTON, May 1, 1879.

Hon. TIMOTHY T. SAWYER,

Chairman of the Boston Water Board: —

SIR, — Agreeably to the requirements of Section 15 of the ordinance regulating the assessment of water-rates, the undersigned respectfully submits the following report: —

The total number of water-takers now entered for the year 1879 is 51,523, being an increase since January 1, 1878, of 1,553.

The total number of cases where the water has been turned off for non-payment of rates during the year ending January 1, 1879, is 1,423. Of this number 1,140 have been turned on, leaving a balance of 283 still remaining off.

The total amount of water-rates received from April 30, 1878, to May 1, 1879, is . . .	\$1,011,655 21
Of this amount there was received for water used in previous years . . .	\$61,915 59
Leaving the receipts for water furnished during the financial year . . .	950,240 44
The amount of rates received from East Boston is . . .	61,915 59
Of this amount there has been paid to the Mystic Department, for water furnished during the year . . .	48,851 11
In addition to the above, there has been received for turning on water, in cases where it had been turned off for non-payment of rates, the sum of . . .	1,678 00
Total receipts for summons . . .	1,567 25
Total . . .	<u>\$1,014,900 46</u>

The estimated amount of income from the sales of water during the year ending with April 30, 1880, is	\$965,000 00
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The expenditures of my office, during the year 1878, have been	\$22,794 85
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METERS.

The total number of meters now attached to the premises of water-takers is 1,089. Of this number, 680 are $\frac{5}{8}$ -inch; 345 one-inch; 43 two-inch; 17 three-inch; 4 four-inch sizes. In addition, there are 123 elevators and 23 organ motors, with indicators attached to determine the quantity of water consumed.

The following table exhibits the class of premises to which meters are attached, together with the amount of revenue received during the year 1878:—

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
Revere House	Hotel	3					1	4	5,050,232	\$1,262 54
American House	"	2	1	1				4	8,982,241	2,245 55
Parker House	"	1	4					5	10,223,149	2,555 78
U. S. Hotel	"	3					2	5	7,385,371	1,846 32
Tremont House	"	2	3					5	8,455,756	2,113 94
Young's Hotel	"	2	2				1	5	8,517,389	2,129 35
Adams House	"	2	1				1	4	4,030,688	1,007 66
Hotel Berkeley	"	1	1					2	2,355,683	588 91
Albion Building	"	1						1	1,687,598	421 89
Central House	"	1						1	102,909	25 72
Hotel Pelham	"	1	3					4	1,327,718	331 93
Hotel Boylston	"	1					1	2	2,088,166	522 04
La Grange House	"	1	1					2	449,101	112 27
St. Cloud	"	2					2	4	1,248,998	312 24
Hotel Clarendon	"	1					1	2	507,113	126 77
Seaver House	"	1						1	212,739	53 17
Evans House	"	2						2	1,098,105	274 52
Park-square Hotel	"	1						1	114,279	28 56
Hotel Kempton	"	1	1				1	3	1,433,589	358 39
Hotel Hamilton	"	1	1				1	3	1,923,662	480 90
Hotel Vendome	"	2					2	4	4,720,603	1,180 13
Coolidge House	"	5					2	7	1,230,136	307 52
Hancock House	"	1						1	60,173	15 03
Merrimac House	"	1						1	283,350	70 84
Stanley House	"	2						2	353,371	88 33
International Hotel	"	1					1	2	2,490,556	622 63
Hotel Alexander	"	1					1	2	1,467,738	366 92
Hotel Brunswick	"	3						3	6,299,895	1,574 97
Park's Hotel	"	2						2	463,074	115 77
Derby House	"	3						3	514,553	128 63
City Hotel	"	1						1	319,727	79 93
Amount carried forward									85,397,662	\$21,349 15

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i> . . . . .		.	.	.	.	.	.	.	85,397,662	\$21,349 15
Hotel Albermarle	Hotel . . . . .	.	1	.	.	.	.	1	1,066,083	264 01
Ashland House . . . . .	" . . . . .	.	1	.	.	.	.	1	470,851	117 69
Hotel Columbus . . . . .	" . . . . .	.	1	.	.	.	1	2	2,492,574	623 13
Hotel Glover . . . . .	" . . . . .	.	1	.	.	.	2	3	386,318	96 58
Merchants' Hotel	"	1	.	.	.	.	.	1	192,616	48 14
M. J. Flatley	"	1	.	.	.	.	.	1	130,238	32 54
New England House . . . . .	" . . . . .	.	1	.	.	.	.	1	689,671	172 40
Winthrop House	"	1	.	.	.	.	.	1	448,456	112 10
Dooley's Hotel	"	1	.	.	.	.	.	1	87,669	21 92
Falmouth House	"	2	.	.	.	.	.	2	310,636	77 65
Job A. Turner . . . . .	" . . . . .	.	1	.	.	.	.	1	312,271	78 07
Milliken House	"	3	.	.	.	.	.	3	481,861	120 46
Sherman House . . . . .	" . . . . .	.	2	.	.	.	.	2	1,496,297	374 06
Everett House . . . . .	" . . . . .	.	1	.	.	.	.	1	336,608	84 14
Metropolitan House . . . . .	" . . . . .	.	2	.	.	.	.	2	1,409,663	352 41
Commonwealth Hotel . . . . .	" . . . . .	.	1	.	.	.	1	2	1,681,898	420 47
St. James Hotel . . . . .	" . . . . .	.	3	.	.	.	.	3	1,984,794	496 19
Massachusetts House	"	1	.	.	.	.	.	1	87,773	21 94
Bay State House	"	1	1	.	.	.	.	2	893,498	223 36
Mariner's House	"	1	.	.	.	.	.	1	198,338	49 59
Robertson House	"	2	.	.	.	.	.	2	173,562	43 38
Boston Hotel	"	1	.	.	.	.	.	1	412,434	103 10
Creighton House	"	2	1	.	.	.	2	5	4,287,987	1,071 99
Van Renssalcarr . . . . .	" . . . . .	.	2	.	.	.	.	2	542,564	135 89
Quiney House	"	3	2	.	.	.	.	5	2,675,761	668 93
Marston House	"	1	.	.	.	.	.	1	778,508	194 62
Stumcke & Goodwin	"	2	1	.	.	.	.	3	3,454,980	863 74
Pavilion House . . . . .	" . . . . .	.	1	.	.	.	.	1	495,969	123 98
Norfolk House	"	1	.	.	.	.	.	1	583,973	145 98
National House . . . . .	" . . . . .	.	1	.	.	.	.	1	814,261	203 56
Hotel Agassiz . . . . .	" . . . . .	.	1	.	.	.	2	3	2,034,323	508 58
Phillips House	"	1	.	.	.	.	.	1	67,231	16 80
Albany House . . . . .	" . . . . .	.	1	.	.	.	.	1	272,176	68 04
Cattle Fair Hotel . . . . .	" . . . . .	.	1	.	.	.	.	1	158,424	39 60
Phoenix House	"	1	.	.	.	.	.	1	272,920	68 23
<i>Amount carried forward</i> . . . . .		.	.	.	.	.	.	.	117,571,838	\$29,392 42

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									117,571,838	\$29,392 42
Hotel Huntington	Hotel	1						1	321,551	80 38
Hotel Cluny	"	1					4	5	1,737,848	424 45
Stinson House	"	1						1	128,401	32 09
John D. Miller	"	2						2	279,398	69 84
Moody Merrill	"	1	1					2	1,345,096	336 27
Old Colony and Newport Railroad Co.		6	3	2				11	20,330,335	5,082 55
Boston and Albany Railroad Co.		17	8	2				27	36,886,417	9,221 58
Boston and Maine Railroad Co.		1	3					4	5,503,524	1,375 87
Boston and Lowell Railroad Co.			3	1			1	5	6,472,059	1,618 01
Fitchburg Railroad Co.			2					2	4,224,511	1,056 12
Eastern Railroad Co.		1	2	1				4	6,043,591	1,510 89
New York and New England Railroad Co.			1		2			3	14,251,404	3,562 85
Boston and Providence Railroad Co.		3	2	3				8	11,056,878	2,764 20
Boston, Revere Beach, and Lynn Railroad Co.				2	1			3	3,674,400	918 58
Boston, Winthrop, and Point Shirley Railroad Co.			1					1	345,445	86 36
Boston Gas Light Co.		1	3	2		1		7	32,278,207	8,069 55
South Boston Gas Light Co.		1	1					2	704,986	176 24
East Boston Gas Light Co.			1					1	1,180,056	282 50
Roxbury Gas Light Co.		2	1					3	1,274,605	318 62
Dorchester Gas Light Co.			1					1	457,396	114 34
Standard Sugar Refinery		1			1	1		3	58,266,422	14,566 60
Jasper Sugar Refinery			1	1				2	10,828,561	2,707 14
Continental Sugar Refinery				2				2	11,555,400	2,888 85
Bay State Sugar Refinery				1				1	6,808,875	1,702 20
Oxnard Sugar Refinery			3					3	3,243,526	810 87
Boston Sugar Refinery					1			1	38,550	9 64
Bay State Rolling Mill			4	1	1			6	Not using.	
Norway Iron Works		3	7	1				11	24,631,201	6,157 78
Highland Spring Brewery	Brewery		1	2				3	6,414,968	1,603 74
Edward Habich	"		1					1	3,605,963	901 48
J. W. Kenney	"		1					1	1,605,234	401 30
<i>Amount carried forward</i>									393,016,646	\$98,253 26

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward.</i>									393,016,646	\$98,253 26
Frey & King	Brewery		1					1	753,179	188 29
H. & J. Pfaff	"			1				1	6,498,975	1,624 74
Marshall Brewery	"			1				1	1,489,906	372 47
A. J. Houghton & Co., Hallock st.	"		1					1	407,409	101 84
A. J. Houghton & Co., Station st.	"		1					1	778,741	194 68
Boylston Brewery	"		2					2	1,859,261	464 80
Gottlieb Burkhardt	"		1					1	2,385,803	596 44
John Roessele	"			1				1	7,868,700	1,967 16
Jones, Cook, & Co.	"		1	1				2	5,473,441	1,368 35
Boston Beer Co.	"		2					2	5,931,729	1,482 93
Conrad Decker	"		1					1	881,492	220 37
Suffolk Brewing Co.	"			1				1	7,348,575	1,837 14
Burton Brewery	"		1					1	1,043,175	260 78
Elmwood Spring Brewery	"		1					1	1,143,462	285 85
Vincent & Hathaway	Beer Factory		1					1	589,373	147 34
Moses Fairbanks & Co.	"		1					1	614,694	153 67
Coburn, Lang, & Co.	"		1					1	317,663	79 40
Comstock, Gove & Co.	"		1					1	262,779	65 69
Isaac Pratt, Jr.	Building		1	1				2	921,016	230 25
Wesleyan Association	"		3					3	363,915	90 96
Tremont Temple	"		1	1				2	1,319,184	329 79
S. S. Houghton & Co.	"		1					1	569,911	142 47
P. McAleer	"		2					2	309,092	77 48
Smith & Porter	"		2					2	849,938	212 47
F. A. Dewson	"		2					2	744,106	186 02
Boston Journal	"			1				1	1,502,423	375 60
Joseph Byers	"		2					2	742,164	185 52
N. E. Mut. Life Ins. Co., 70 State st.	"		2					2	81,834	20 45
N. E. Mut. Life Ins. Co., Milk st.	"		1	1				2	1,346,430	336 60
Horticultural Hall	"			1				1	269,926	67 47
Suffolk National Bank	"		2	1				3	180,482	45 11
Benjamin Leeds	"		2					2	249,279	62 31
Blackstone Market	"		2					2	135,691	33 92
<i>Amount carried forward</i>									448,251,294	\$112,061 62

Name.	Class.	5.8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									448,251,294	\$112,061 62
John Rayner, heirs	Building	2						2	204,600	51 14
Otis T. Ruggles	"	2						2	252,211	63 05
Turn Hall	"	1						1	320,919	80 22
B. B. Appleton, heirs	"	1						1	161,949	40 48
J. W. Merriam	"	2						2	148,891	37 21
Peter B. Brigham	"	2						2	335,814	83 95
Mrs. Ellen Brooks	"	1						1	115,561	28 88
Oriental Tea Company	"	1						1	250,584	62 63
S. D. Hicks	"	1 1						2	1,775,161	443 78
John Stetson	"	1						1	1,850,093	462 51
Macullar, Williams, & Parker	"	1						1	437,409	109 34
John F. Mills	"	1						1	321,120	80 28
Lilly, Young, Pratt, & Brackett	"	1						1	2,203,074	550 76
J. I. Brown & Son	"	1						1	272,588	68 13
Hogg, Brown, & Taylor	"	1 1						3	3,068,911	767 22
A. Wentworth	"	2						2	211,539	52 87
William Ropes, estate	"	4 1						5	2,176,860	544 21
A. D. Puffer	"	1						1	462,812	115 69
Eastern Express Co.	"	1						1	611,858	152 96
Grand Lodge of Masons	"	1 1						2	292,561	73 13
James W. Rollins	"	1						1	300,885	75 21
Haley, Morse, & Co.	"	2						2	49,659	12 41
Mass. Inst. of Technology	"	2						2	1,079,469	269 86
S. N. Brown, Jr.	"	1						1	233,783	58 44
A. H. Vinton	"	1						1	233,154	58 28
A. Stowell	"	1						1	176,656	44 16
B. F. Bradbury	"	1						1	204,316	51 07
Shepard, Norwell, & Co.	"	4						4	432,316	108 07
D. J. Hastings	"	1						1	177,999	44 49
C. U. Cotting, 628 Wash. st.	"	5						5	653,206	163 29
C. U. Cotting, 7 Court sq.	"	1 1						2	181,367	45 34
W. H. Mann	"	2						2	483,999	120 98
Smith & Watson	"	1						1	84,128	21 03
H. C. Stephens (3 mos.)	"	1						1	56,453	14 11
<i>Amount carried forward</i>									468,073,199	\$117,016 80

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									468,073,199	\$117,016 80
Jordan, Marsh, & Co., Wash- ington street	Building	4						4	802,216	200 55
G. T. Burnham & Co.	"		1					1	715,973	178 99
G. D. Dowes & Co., vacant	"		1					1		
Stephen H. Bennett, heirs	"		2					2	676,228	169 05
W. H. Foster	"		1					1	136,193	34 03
Brown & Seavey	"		1					1	202,659	50 66
Franklin Evans	"		1					1	159,684	39 92
J. Zane & Co.	"		2					2	243,953	60 99
Art Garden	"		1					1	1,424,266	356 06
Allen & Woodworth	"		1					1	218,941	54 73
Merchants' Exchange	"		1	1			1	3	2,510,911	627 72
H. M. Burr & Co.	"		2					2	153,106	38 27
J. T. Brown & Co.	"		1					1	230,289	57 56
J. C. Gray	"		3	1				4	493,583	123 39
C. F. Hovey & Co.	"		3	1				4	942,571	235 64
Globe Publishing House	"		1					1	944,291	236 07
J. M. Smith & Co.	"		1					1	38,266	9 56
Charles Rollins	"		1					1	985,223	246 30
Adams Express Co.	"		2	1				3	323,041	80 75
A. J. Wright	"			1				1	1,023,984	255 99
W. Blenkinsop	"		2					2	300,369	75 09
Boston Gas Light Co.	"		2					2	104,378	26 09
John F. Wilson	"		1					1	297,488	74 35
L. P. Ober	"		1					1	351,901	87 97
Young Men's Christian As- sociation	"		1					1	235,646	71 40
A. A. Miner	"		1					1	165,091	41 27
Henry F. Miller	"			1				1	257,288	64 32
Art Building	"			1				1	306,857	76 71
Equitable Life Ins. Co.	"		1	1				2	1,302,735	325 67
R. H. White & Co.	"			1				1	1,820,626	455 14
H. S. Lawrence	"		1					1	85,359	21 33
Young Men's Christ'n Union	"		1	1				2	2,311,788	577 94
W. R. Clark	"		1					1	475,013	118 75
<i>Amount carried forward</i>									488,363,116	\$122,089 06

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									488,363,116	\$122,089 06
Deacon House	Building	1						1	49,434	12 35
Boston Herald Building . .	"	3						3	2,441,619	610 39
Mass. Charitable Mechanic Association	"		1				1	2	1,376,400	344 10
Loring & Dexter, Trust. . .	"	2						2	450,458	112 61
Commonwealth Building . .	"	1						1	796,261	199 06
Mutual Life Ins. Co. of N.Y.	"		1					1	516,075	129 01
F. Tudor	"	3						3	1,063,292	265 81
Studio Building		1						1	541,779	135 43
Boston Post Building		1						1	1,020,984	255 23
Traveller Building		2	1					3	657,144	164 23
Union Building		5						5	952,779	238 19
Wentworth Building		1						1	534,623	133 65
Rice Building		1						1	404,049	101 00
Carter Building		2						2	138,586	34 63
Edmands Building		1						1	244,208	61 04
Washington Building		3						3	768,299	192 07
Niles Building		2						2	978,594	244 64
Palmer's Building		1						1	207,210	51 79
Joy's Building		3						3	337,351	84 32
Joshua M. Sears, 199 Wash- ington street		2	1					3	1,625,589	406 39
Advertiser Building		1						1	935,356	233 83
Charity Building		2						2	283,853	70 95
Codman Building		7						7	863,125	215 77
Transcript Building		1	1					2	639,159	159 77
Merchants' Bank Building . .		1	1					2	1,366,794	341 69
Paine Memorial Hall			1					1	233,153	58 28
Chauncy Hall School		1						1	127,329	31 82
Mass. General Hospital . . .		3	4	1				8	6,551,131	1,637 78
City Hospital		1	7					8	9,813,084	2,453 26
Lunatic Hospital		1	3					4	3,548,214	867 05
New England Hospital		1						1	621,324	155 32
Mass. Homœopathic Hospi- tal		1						1	538,441	134 60
Notre Dame Academy		1						1	350,251	87 55
<i>Amount carried forward</i>									529,339,064	\$132,332 72

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Totals.	Gallons.	Revenue.
<i>Amount brought forward</i> . . . . .		.	.	.	.	.	.	..	529,339,064	\$132,332 72
House of the Angel Guardian		2	.	.	.	.	.	2	529,184	132 28
House of the Good Shepherd (3 months)		1	.	.	.	.	.	1	286,629	71 65
Home for Catholic Children . . . . .		.	1	.	.	.	.	1	308,235	77 06
Church Home . . . . .		.	1	.	.	.	.	1	567,008	141 74
Sailors' Home . . . . .		.	1	.	.	.	.	1	551,633	137 90
Temporary Home		1	.	.	.	.	.	1	430,381	107 58
Somerset Club		2	.	.	.	.	.	2	1,636,853	409 20
Union Club		1	.	.	.	.	.	1	857,719	214 42
Temple Club . . . . .		.	1	.	.	.	.	1	237,946	59 47
Central Club		1	.	.	.	.	.	1	114,431	28 59
Boston Music Hall		3	.	.	.	.	.	3	681,534	170 37
Beethoven Hall		1	.	.	.	.	.	1	224,349	56 07
City Hall		1	2	.	.	.	.	3	1,848,955	462 24
State of Massachusetts	State House .	2	1	.	.	.	.	3	1,355,430	338 85
United States	Post Office .	.	.	1	.	.	.	1	1,316,925	329 22
Howard Athenæum		1	.	.	.	.	.	1	53,543	13 38
Boston Theatre . . . . .		.	2	.	.	.	.	2	568,643	142 15
Globe Theatre		4	.	.	.	.	.	4	164,817	41 20
Boylston Market		5	.	.	.	.	.	5	562,209	140 54
Washington Market		2	1	.	.	.	.	3	441,917	110 46
Suffolk Market		4	.	.	.	.	.	4	363,677	90 90
Franklin Market . . . . .		.	1	.	.	.	.	1	82,410	20 59
Williams Market		3	.	.	.	.	.	3	159,598	39 89
Medical College . . . . .		.	1	.	.	.	.	1	551,634	137 90
Boston College		1	1	.	.	.	.	2	543,714	135 91
Mrs. C. C. Annable	Boarding . .	3	.	.	.	.	.	3	248,393	62 09
Mrs. W. A. Colson	"	2	.	.	.	.	.	2	194,439	48 59
Charles W. Smith	"	2	.	.	.	.	.	2	200,476	50 11
M. P. Carr	"	1	.	.	.	.	.	1	162,961	40 72
J. H. Grout	"	1	.	.	.	.	.	1	280,853	70 20
George Odin, heirs	"	1	.	.	.	.	.	1	151,389	37 84
James F. Goodwin	"	2	.	.	.	.	.	2	361,466	90 36
Mrs. D. L. Morse (6 mos.)	"	1	.	.	.	.	.	1	91,666	22 91
Mrs. C. Farley	"	1	.	.	.	.	.	1	97,832	24 44
<i>Amount carried forward</i> . . . . .		.	.	.	.	.	.	..	545,567,898	\$136,389 54

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									545,567,898	\$136,389 54
Mrs. C. Cummings	Boarding	1						1	248,971	62 24
James Knowlton	"	1	1					2	988,283	247 05
Ruel Philbrook	"	2						2	328,186	82 04
J. A. Merrill (6 mos.)	"		1					1	167,663	41 91
Mrs. G. A. Winn	"	1						1	183,421	45 64
Mrs. N. F. Chapin	"	1						1	152,304	38 07
William Evans	Model	3						3	391,958	97 99
E. Cutler, 147 Kneeland st.	"	2						2	143,206	35 80
E. Cutler, 146 Kneeland st.	"	2						2	262,419	65 60
Michael Doherty	"	4						4	344,791	86 20
Job A. Turner	"	1						1	46,906	11 71
James Chisholm	"	1						1	176,986	44 24
J. Collins	"	2						2	197,041	49 25
D. L. Webster	"	1					1	2	947,341	236 82
Thomas Cantlon	"	1						1	147,159	36 78
W. B. Mendum	"	2						2	72,233	18 05
Lowell Five-Cent Savings Bank	"		1					1	1,002,593	250 64
N. Whiting	"		1						317,888	79 47
David Wilcox & Co., 8 Boylston square.	Factory	3						3	1,147,562	286 87
J. Morrill, Jr., & Co.	"	1						1	222,766	55 67
Pearson Bros. & Co.	"		1					1	1,529,633	382 40
J. Morse	"	1						1	247,050	61 75
L. Whittaker	"	1						1	102,594	25 64
C. Wright & Co.	"	1						1	333,864	83 45
Howard Watch & Clock Co.	"		2					2	263,024	65 74
Haley, Morse, & Co.	"	1						1	Vacant	
Roxbury Carpet Co.	"		1					1	3,140,836	785 20
George C. Pearson	"	1						1	366,511	91 62
Putnam Nail Co.	"	1	2					3	3,279,436	819 85
William Carleton	"	1	2					3	494,674	123 66
Murphy, Leavens, & Co.	"	1						1	354,758	88 68
H. M. Richards	"	1						1	401,200	100 29
Charles E. Kershaw (3mos.)	"	1						1	171,713	42 93
<i>Amount carried forward</i>									563,742,868	\$140,932 99

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									563,742,868	\$140,932 99
E. Strain & Co.	Factory	1	.	.	.	.	.	1	152,371	38 08
Peet Valve Co. (6 mos.) . .	"	1	.	.	.	.	.	1	166,148	41 53
A. W. Bailey	"	2	.	.	.	.	.	2	40,111	10 02
C. M. Clapp & Co.	"	1	.	.	.	.	.	1	240,560	60 14
Pratt Bros.	"	1	.	.	.	.	.	1	263,483	65 85
Byam, Carlton, & Co. . . .	"	1	.	.	.	.	.	1	57,931	14 48
Vose & Sons	"	1	.	.	.	.	.	1	104,716	26 17
Stephen Smith & Co.	"	1	.	.	.	.	.	1	226,186	56 54
Chickering & Sons	"	3	.	.	.	.	.	3	1,487,153	371 73
Mace & Keys	"	1	.	.	.	.	.	1	176,949	44 23
Bagnall & Loud	"	1	.	.	.	.	.	1	199,974	49 99
Boston Car Spring Co. . .	"	1	.	.	.	.	.	1	632,783	158 19
A. Folsom & Sons	"	1	.	.	.	.	.	1	547,284	136 82
Dwinell, Hayward, & Co. .	"	1	.	.	.	.	.	1	564,819	141 20
J. M. Cook, estate	"	1	.	.	.	.	.	1	1,215,849	303 95
Hallet & Davis	"	1	.	.	.	.	.	1	118,193	29 53
S. D. & H. W. Smith, Mont- gomery st.	"	1	.	.	.	.	.	1	723,923	180 97
S. D. & H. W. Smith, Al- bany st.	"	1	.	.	.	.	.	1	694,374	173 58
Harrison, Beard, & Co. . .	"	1	.	.	.	.	.	1	598,471	149 60
William Underwood & Co.	"	2	.	.	.	.	.	2	599,221	149 80
G. D. Dowes & Co.	"	1	.	.	.	.	.	1	534,766	133 68
D. Wileox & Co., Avery st.	"	1	.	.	.	.	.	1	171,804	42 94
C. P. George & Co.	"	1	.	.	.	.	.	2	331,148	82 78
Boston Belting Co.	"	1	.	.	.	.	.	1	212,708	53 17
Richardson, McKee, & Co.	"	1	.	.	.	.	.	1	490,584	122 64
H. Barker	"	1	.	.	.	.	.	1	45,023	11 25
Conrad Zeigler	"	1	.	.	.	.	.	1	532,623	133 14
C. H. Bacon	"	2	.	.	.	.	.	2	1,194,924	298 72
Morton & Chesley	"	1	.	.	.	.	.	1	1,408,276	352 06
A. Zeigler	"	1	.	.	.	.	.	1	58,456	14 61
Cummings & Carlisle . . .	"	1	.	.	.	.	.	1	1,129,996	282 49
Walworth Manufact. Co. .	"	1	.	.	.	.	.	1	346,119	86 52
Newton, Morton, & Co. . .	"	1	.	.	.	.	.	1	253,621	63 39
A. J. Morse & Co.	"	2	.	.	.	.	.	2	416,131	104 03
<i>Amount carried forward</i>									579,679,551	\$144,916 81

Name.	Class.	3-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									579,679,551	\$144,916 81
Seth W. Fowle & Son	Factory	1						1	32,258	8 06
H. B. Arnold & Co.	"	1						1	494,784	123 69
E. L. Perkins	"	1						1	70,441	17 60
Chadwick Lead Works (7 mos.)	"	1						1	147,136	36 78
Grocers' Packing Co. (7 mos.)	"	1	1					2	540,098	135 02
B. F. Sturtevant (6 mos.)	"	1						1	58,576	14 64
Charles Woodbury	"	1						1	161,589	40 39
W. P. Emerson Piano Co.	"	1						1	977,588	244 39
Hallett & Cumston	"	1						1	200,672	50 14
P. Lally	"	1						1	357,796	89 45
S. G. Underhill	"	1						1	468,744	117 18
Amer. Molded Collar Co.	"	1						1	563,326	140 82
Kittredge & Co.	"	1						1	23,604	5 90
D. Shales & Co.	"	1						1	342,137	85 52
Christopher Blake	"	1						1	301,636	75 41
G. H. Dickerman	"	1						1	263,671	65 91
J. L. Ross	"	2						2	195,841	48 94
R. Estabrook & Son	"	1						1	121,920	30 47
George Gill	"	1						1	157,080	39 26
F. King & Co.	"	1						1	428,663	107 16
Grover & Baker Sewing Machine Co., Wash. st.	"	3						3	7,253	1 81
Peet Valve Co.	Machinist	1						1	226,838	56 70
G. F. Waldron	"	1						1	Vacant.	
A. K. Young	"	2						2	576,271	144 06
Harrison Loring	"	2	1					3	185,468	46 32
S. A. Woods & Co.	"	1						1	584,588	146 13
George F. Blake	"	1						1	1,185,257	296 30
E. H. Ashcroft	"	1						1	519,196	129 79
L. M. Ham	"	2						2	408,879	102 20
Eyelet Tool Co.	"	1						1	Vacant.	
L. A. Bigelow	"	1						1	887,941	221 98
William Evans	"	3	1					4	1,052,649	263 16
Smith & Lovett	"	1						1	185,281	46 32
<i>Amount carried forward</i>									591,406,732	\$147,848 31

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									591,406,732	\$147,848 31
Am. Tool and Machine Co.	Machinist		1					1	857,178	214 28
J. Souther & Co.	"	1						1	88,939	22 22
Boston Machine Co.	"	1	1					2	1,245,368	811 32
Hersey Brothers	"	1						1	187,448	46 86
Hinckley Locomotive Works	"	1	3					4	1,072,328	268 06
Atlantic Works, Chelsea st.	"		1					1	1,448,440	362 10
Atlantic Works, Border st.	"			1				1	1,301,925	325 47
Holmes & Blanchard, Charlestown st.	"		1					1	1,438,483	359 60
H. S. Robinson	"		1					1	188,341	47 07
Geo. T. McLaughlin	"		2					2	642,054	160 50
South Boston Iron Co.	Foundry	3	2	1				6	1,389,485	347 37
Holmes & Blanchard, Tay- lor street	"	1						1	269,139	67 28
James Gurney & Co.	"	1						1	58,981	14 74
William Blake & Co.	"		1					1	846,454	211 60
Whiting Foundry Co.	"	1						1	393,009	98 23
Tremont Foundry Co.	"	1						1	63,833	15 96
Fulton Iron Foundry Co.	"		1					1	129,241	32 31
Chelmsford Iron Foundry Co.	"		1					1	1,005,384	251 34
Highland Foundry Co.	"	1						1	318,353	79 58
W. H. Washburn	"	1						1	10,388	2 59
George Miles	Boiler Maker	1						1	215,896	53 97
Downer Kerosene Oil Co.	Oil Works	2	1	1				4	7,517,445	1,879 35
S. Jenney & Co.	"		2					2	1,199,469	299 85
Maverick Oil Co.	"		1					1	415,906	103 97
Pierce & Canterbury	"		1					1	1,031,888	257 96
Kidder, Vaughan, & Co.	"		1					1	157,442	39 34
Bowker, Torrey, & Co., Bowker street	Marble Works	1	1					2	3,153,467	768 36
Bowker, Torrey, & Co., Foundry street	"	1	1					2	Vacant.	
Torreys & Co.	"		2	1				3	2,720,462	680 10
C. E. Hall & Co.	"		2	1				3	2,498,469	624 61
A. Wentworth & Co.	"		4					4	1,975,448	493 85
Richard Power & Son	"		2					2	486,825	121 70
<i>Amount carried forward</i>									625,734,168	\$156,429 85

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									625,734,168	\$156,429 85
Jeremiah Carew	Stone Yard . .	2						2	173,480	43 37
E. F. Meaney	" . .	2	1					3	1,173,293	293 31
Geo. F. Chapin & Co. . . .	Vinegar W'ks . .	1						1	114,495	23 64
Pike & Fabins	Pickle Factory . .		1					1	358,171	89 54
Horace H. Lewis	" . .	1						1	116,041	29 00
W. K. Lewis & Bros. . . .	" . .	1						1	190,014	47 49
B. M. Clark	" . .	1						1	176,311	44 06
E. T. Cowdrey & Co. . . .	" . .	2						2	432,774	108 18
Warner & Freeman	Salt Works . .	1						1	219,368	54 83
Fobes, Hayward, & Co. . .	Confectionery . .	1						1	660,092	165 00
Chase & Co.	" . .		1					1	1,248,571	312 13
Charles Copeland	" . .	3						3	551,318	137 82
E. M. Messenger	Restaurant . .	1						1	253,291	63 31
Mrs. G. F. Harrington . .	" . .	1						1	318,991	79 74
Marston & Cunio	" . .	1						1	282,496	70 61
W. L. Egerton	" . .	1						1	327,414	81 85
Frost & Dearborn	" . .		1					1	580,876	145 21
George Fera	" . .	1						1	362,461	90 60
D. T. Copeland	" . .		1					1	1,361,071	340 26
F. E. Weber	" . .	1						1	240,931	60 22
R. B. Brigham	" . .	1	1					2	1,239,054	309 75
W. F. Bacon	" . .	1						1	168,945	42 22
A. W. Fisher	" . .	1						1	278,454	69 61
Frank B. Ingalls (3 mos.) .	" . .	1						1	42,255	10 56
Campbell & Coverly	" . .	1						1	385,156	96 27
Severance & Co.	" . .	1						1	135,916	33 98
O. A. Jones	" . .	1						1	269,004	67 24
O. S. Edgerly	" . .	1						1	70,351	17 58
C. H. Bailey	" . .	1						1	149,370	37 33
E. E. Tucker	" . .	1						1	313,561	78 38
R. M. Waitt	" . .	1						1	190,681	47 66
C. E. Bacon	" . .	1						1	307,531	76 88
J. C. Murphy	" . .	1						1	27,143	6 78
J. Gallagher	" . .	1						1	167,168	41 78
<i>Amount carried forward</i>									638,620,216	\$159,651 04

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									638,620,216	\$159,651 04
A. E. Stahl & Co.	Restaurant . .	1	.	.	.	.	.	1	95,888	23 96
Dearborn & Ingalls	" . .	1	.	.	.	.	.	1	255,383	63 86
A. R. Weir	" . .	1	.	.	.	.	.	1	216,842	54 20
Mrs. A. Cook	" . .	1	.	.	.	.	.	1	313,936	78 48
Walter Grieve	" . .	1	.	.	.	.	.	1	150,086	37 51
A. F. Copeland	" . .	1	.	.	.	.	.	1	366,188	91 53
J. Backus	" . .	1	.	.	.	.	.	1	453,384	113 34
W. S. Matthews	" . .	1	.	.	.	.	.	1	287,791	71 94
Brock & Coy, 243 Atlantic avenue	" . .	1	.	.	.	.	.	1	236,792	59 19
Brock & Coy, 73 Clinton st.	" . .	1	.	.	.	.	.	1	127,711	31 92
W. C. Cahoon & Son . . .	" . .	1	.	.	.	.	.	1	301,628	75 41
Durgin, Park, & Co. . . .	" . .	1	.	.	.	.	.	1	381,286	95 31
Paul & Savoy	" . .	1	.	.	.	.	.	1	315,314	78 82
Smith & Underwood . . .	" . .	1	.	.	.	.	.	1	796,531	199 13
J. M. Learned	" . .	1	.	.	.	.	.	1	499,884	124 95
Charles Vossler	" . .	1	.	.	.	.	.	1	506,813	126 69
Tibbets & Russell	" . .	2	.	.	.	.	.	2	470,048	117 51
J. H. Blodgett	" . .	1	.	.	.	.	.	1	561,286	140 31
R. R. & J. S. Higgins . . .	Saloon	2	.	.	.	.	.	2	844,569	211 14
Atwood & Bacon	"	1	.	.	.	.	.	1	104,498	26 12
Smith & Wright	"	1	.	.	.	.	.	1	491,229	122 79
Palais Royal	"	1	.	.	.	.	.	1	104,108	26 02
Felton & Son	Distillery . . .	2	.	.	.	.	.	2	1,190,034	297 49
Jonas H. French	"	1	.	.	.	.	.	1	629,648	157 40
C. H. Graves	Rectifier . . .	1	.	.	.	.	.	1	242,619	60 65
James Edmond & Co. . . .	Fire Brick . .	1	.	.	.	.	.	1	327,459	81 86
A. Hale & Co.	Rubber Works	1	.	.	.	.	.	1	250,391	62 58
Byron & Hall	Currier	1	.	.	.	.	.	1	49,651	12 41
W. H. Swift & Co.	Fertilizers . .	1	1	.	.	.	.	2	935,183	233 79
W. L. Bradley	"	1	.	.	.	.	.	1	3,182,776	795 69
W. H. Bowker & Co. . . .	"	1	.	.	.	.	.	1	386,554	96 63
B. Randall	"	1	.	.	.	.	.	1	412,614	103 14
Boston Dye Wood & Chem- ical Co.	Chemicals . . .	2	.	.	.	.	.	2	11,134,374	2,783 58
W. H. Whitmore	"	1	.	.	.	.	.	1	991,936	247 97
<i>Amount carried forward</i>									666,234,710	\$167,418 09

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									666,234,710	\$166,554 36
M. Crocker & Co.	Chemicals	1	1					2	Closed.	
G. W. & F. Appleton	"	1						1	10,458	2 62
Preston & Merrill	Extracts			1				1	597,825	149 44
Quirin & Edwards	Tannery		1					1	444,444	111 11
F. S. Merritt	"	1						1	226,170	56 53
R. W. Ames & Son (3mos.)	"	1						1	14,820	3 70
James A. Frampton	"	1						1	147,390	36 83
Boston Forge Co.			1					1	1,278,722	319 68
Boston Lead Co.			1	1				2	591,068	147 76
A. N. Hardy	Photographer	1						1	144,328	36 06
Compressed Shafting Co.			1					1	70,148	17 52
Suffolk Glass Co.			1					1	726,233	181 55
Washington Pipe Works			1					1	44,993	11 25
East Boston Pottery			1					1	475,395	118 86
Simpson's Dry Dock Co.			1					1	459,166	114 78
Cunard Steamship Co.					1			1	3,336,383	834 09
Union Freight Railway Co.					1			1	1,154,100	288 52
W. B. Gleason & Co.	Carving	1						1	130,721	32 67
Butchers' Slaughtering and Melting Association			1					1	4,116,931	1,029 22
John Giblin	Skating Rink	1						1		
Boston Skating Rink Co.	"		1					1	100,193	25 04
Metropolitan Railroad Co.	Stables	14	5					19	9,773,745	2,443 41
So. Boston Railroad Co.	"	1	3					4	4,515,781	1,128 93
Highland Railroad Co.	"		5					5	1,735,999	433 95
Draper & Hall	Stable	3						3	1,032,600	258 15
Israel Tibbetts	"	2						2	268,809	67 19
P. E. Murray	"	1						1	247,014	61 74
A. J. Child	"	1						1	539,310	134 82
E. A. Noyes	"		1					1	481,508	120 37
James W. Hale	"	1						1	180,060	45 00
A. H. Foster	"	1						1	139,868	34 95
John Tonry	"	1						1	229,150	57 28
W. L. Wellington	"	1						1	28,440	7 11
Charles R. Smith	"	2						2	206,529	51 62
<i>Amount carried forward</i>									699,683,011	\$174,916 10

Name.	Class.	6-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward.</i>									699,683,011	\$174,916 10
J. Austin Rogers	Stable	1						1	523,384	130 82
Norfolk House Stable	"	1						1	Vacant.	
Charles Foster & Co.	"	1						1	285,001	71 24
Parmenter & Sumner	"	1						1	237,849	59 46
Robert H. Douglass	"	1						1	246,375	61 59
T. H. Seavey	"	1						1	65,438	16 35
J. P. Barnard, 108 Chestnut street	"	1						1	498,473	124 60
J. P. Barnard, cor. Brimmer and Chestnut streets	"		1					1	546,361	136 58
J. P. Barnard, Joy street	"		3					3	693,713	174 68
A. Garcelon	"		2					2	203,851	50 95
C. S. Godfrey	"	1						1	354,975	88 74
G. W. Sherburne	"	1						1	134,048	33 51
J. E. Maynard	"	1						1	631,943	157 98
A. Goss	"	1						1	213,534	53 37
Adams Express Co.	"	1						1	329,963	82 48
J. R. Gott	"	1						1	52,282	13 07
F. S. Merritt	"	1						1	Vacant.	
L. W. Porter & Co.	"	1						1	298,661	74 65
Warner & Richardson	"		2					2	480,406	120 09
George M. King	"	1						1	590,611	147 64
Milo Whitney	"	1						1	156,578	39 14
Daniel Wood	"	1						1	311,889	77 96
T. D. Sullivan	"	1						1	118,080	29 50
Ham & Co.	"		2					2	254,101	63 51
F. E. Russell	"	1						1	132,705	33 16
Edgar Snow	"	1						1	132,916	33 22
John Feeney	"	1						1	106,111	26 52
James Jellison	"	1						1	263,852	65 95
John Miller	"	1						1	210,040	52 51
Shorey & Co.	"		2					2	277,329	69 32
Harwood & Hackett	"	1						1	195,954	48 98
H. C. Nims	"		3					3	417,921	104 47
Boston Hotel Coach Co.	"		2					2	1,084,276	271 06
E. W. Murray, Berkeley st.	"	1						1	284,701	71 16
<i>Amount carried forward.</i>									710,021,332	\$177,500 36

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									710,021,332	\$177,500 36
E. W. Murray, Stanhope st.	Stable	1						1	350,634	87 65
A. B. Atherton	"	1						1	313,374	78 34
Geo. S. Johnson	"		1					1	193,021	48 25
Johnson Bros.	"	1						1	240,834	60 19
T. Thaxter	"	1						1	146,149	36 51
C. A. Upham	"	1						1	194,358	48 58
Howes & Rice	"	2						2	215,993	53 99
Miller & Robinson	"	3						3	132,542	33 13
John Rice	"	3						3	427,861	106 96
Geo. S. Fogg & Co.	"	2						2	475,771	118 94
A. D. Pattee	"	1						1	384,455	91 11
Nelson Brothers	"		1					1	145,000	36 25
Moses Coleman & Son	"	1						1	171,481	42 89
J. H. Richardson	"	2						2	571,381	142 84
Northend & Foster	"	1						1	162,211	40 53
E. A. Batchelder	"		1					1	180,870	45 21
Riverside Club Stable	"	1						1	138,308	34 56
Club Stable, Chardon st.	"	1						1	107,956	26 97
Beacon Club Stable	"	1						1	99,379	24 83
D. G. Leavitt	"	1						1	427,089	106 76
Henry Beckwith	"	2						2	133,299	33 31
F. A. Phelps	"	1						1	454,756	113 68
A. P. Marion	"	1						1	238,200	59 55
W. C. Burgess	"	1						1	140,081	35 02
Parker Bryant	"	1						1	250,666	62 66
B. W. Dean	"	2						2	352,486	88 11
F. S. Rice & Co.	"	1						1	509,775	127 43
M. & W. Ham	"	1						1	220,275	55 07
C. S. Blood & Co.	"	1						1	155,120	38 78
J. H. Pote & Co.	"	1						1	138,684	34 66
J. B. Cassidy & Bro.	"	1						1	164,401	41 09
Peck & Hall	"	1						1	271,306	67 82
J. Hale	"	1						1	245,566	61 38
J. M. Smith	"	1						1	73,194	18 29
<i>Amount carried forward</i>									718,427,808	\$179,601 70

Name.	Class.	5.8 inch. 1 inch.	2 inch. 3 inch.	4 inch. Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>						718,427,808	\$170,601 70
E. R. Webster	Stable	1			1	144,233	36 05
Club Stable, 75 Chestnut st.	"	1			1	144,063	36 01
B. T. Wrightington	"	1			1	79,403	19 85
Clark & Brown	"	1			1	735,744	183 92
William Pike	"	1			1	100,456	25 11
A. H. Foss	"	1			1	150,346	37 58
Cilley & Stimson	"	1			1	281,349	70 33
Club Stable, 44 Joy st.	"	1			1	244,216	61 04
Asa Critchett	"	1			1	110,657	27 65
A. S. Eaton	"	1			1	167,318	41 82
L. A. Noyes	"	1			1	98,790	24 69
Geo. D. Brown	"	1			1	166,321	41 58
J. H. Hathorne	"	1			1	649,006	162 25
H. D. Smith	"	1			1	261,969	65 48
M. Munroe	Stock yard			1	1	1,485,373	371 32
Beacon Park		1			1	169,650	42 41
National Tube Works		1			1	444,256	111 06
Globe Nail Works		1	1		2	2,257,133	564 27
Farrington & Hunnewell	Silversmiths	1			1	108,759	27 19
B. M. Cunningham	Laundry	1			1	508,995	127 23
Manley Howe	Chemist	1			1	476,880	119 22
L. Prang & Co.	Chromos	1			1	430,186	107 54
L. Prang & Co., 1482 Tremont st. (3 mos.)	"	1			1	131,385	32 84
Morse & Jordan	Engine	1			1	211,246	52 80
Francis Brooks	"	1			1	240,151	60 02
Walworth Manuf. Co.	"	1			1	1,450,176	362 52
H. G. Denny	"	1			1	203,024	50 74
Porter & Co.	"	1			1	472,074	118 00
C. U. Cotting	"	1			1	278,813	69 70
Moses B. Wilde	"	1			1	391,126	97 77
John Foster	"	1			1	372,706	93 17
J. M. Sears, 45 Arch st.	"	1			1	726,278	181 56
Briggs & Robinson	Mill	1			1	522,091	130 51
J. S. Potter	"	1			1	804,211	201 04
<i>Amount carried forward</i>						733,446,192	\$183,355 97

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									733,446,192	\$183,355 97
S. B. Stebbins	Mill	1						1	623,439	155 85
L. W. Pickens	"	1						1	389,648	97 40
C. E. Folsom	"	1						1	101,843	25 46
Boston City Flour Mills	"	1						1	2,555,190	638 79
J. J. McNutt	"	2						2	1,783,397	445 84
Glendon Co.	"	1						1	1,883,693	470 92
Manson & Peterson	"	3						3	545,063	136 26
S. G. Bennett	"	1						1	795,243	198 80
Cross & Gilman	"	1						1	485,799	121 44
McQuesten & Fogg	"	1						1	370,005	92 60
J. F. Paul & Co.	"	2						2	1,554,699	388 67
Bugbee & Spooner	"	1						1	537,818	134 45
J. A. Robertson	"	1						1	602,130	150 53
Stetson & Pope	"	1						1	Not using.	
Chauncy, Page, & Co.	"	1						1	422,236	105 55
S. H. L. Pierce	"	1						1	840,444	210 10
A. J. Stearns & Son	"	1						1	7,840	1 96
Palmer, Parker, & Co.	"	1						1	720,510	180 12
J. F. Keating	"	1						1	460,898	115 21
Watson & Blsbee	"	1						1	595,254	148 81
Laming & Drisko	"	1						1	476,161	119 04
Cressey & Noyes	"	1	1					2	1,148,025	287 00
Smith & Jacobs	"	1						1	727,561	181 90
B. D. Whitcomb	"	1						1	1,215,263	303 82
S. Crosby & Son	"	1						1	711,248	177 81
Nathaniel Cummings	"	2						2	146,443	36 80
R. S. Gilmore	"	1						1	85,028	21 25
Glover & Jones	"	1						1	260,469	65 10
Slade Dye Wood Mill	"	2						2	1,273,905	318 47
Knowles, Freeman, & Co.	Fish Store	1						1	507,871	126 96
G. B. Spaulding & Co.	Bacon Works	1						1	141,684	35 40
Bond, Blanchard, Worthen, & Co.	Bakery	1						1	75,121	18 77
G. K. Wlthington & Co.	"	1						1	307,118	76 77
J. H. Chadwick	House & Fount'n	1						1	29,431	7 35
<i>Amount carried forward</i>								000	755,826,669	\$188,950 87

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									755,826,669	\$188,950 87
Horatio Harris (6 mos.)	House & Fount'n	1	.	.	.	.	.	1	212,640	53 15
W. V. Hutchings	Fountain	1	.	.	.	.	.	1	36,503	9 12
J. C. Nichols	Wharf purposes	1	.	.	.	.	.	1	40,931	10 22
Warren & Co., Agts.	Steamers . . . . .	.	.	1	.	.	.	1	459,825	114 96
Hingham Steamboat Co. . . . .	" . . . . .	.	.	.	1	.	.	1	5,399,461	1,349 86
Portland Steam Packet Co. . . . .	" . . . . .	.	.	.	1	.	.	1	1,813,275	453 31
Thayer & Lincoln . . . . .	" . . . . .	.	.	1	.	.	.	1	450,144	112 52
House of Correction . . . . .		.	.	.	.	1	.	1	13,198,350	3,299 59
Suffolk County Court House . . . . .		.	2	.	.	.	.	2	1,019,079	254 76
Suffolk County Jail		2	3	.	.	.	.	5	1,707,008	426 74
Directors of Public Institutions		2	3	1	.	.	.	6	6,089,003	1,519 98
South Ferry . . . . .		.	.	1	1	.	.	2	8,048,793	2,012 19
North Ferry . . . . .		.	.	.	1	.	.	1	8,896,350	2,224 08
Board of Health	Public Urinals	1	.	.	.	.	.	1	1,172,341	293 08
Police Station No. 1		1	.	.	.	.	.	1	132,353	33 09
" " 2 . . . . .		.	1	.	.	.	.	1	372,136	93 03
" " 3 . . . . .		.	1	.	.	.	.	1	310,696	77 67
" " 4		1	.	.	.	.	.	1	280,006	70 00
" " 5		1	.	.	.	.	.	1	288,713	72 18
" " 6		1	.	.	.	.	.	1	184,238	46 05
" " 7		1	.	.	.	.	.	1	369,053	92 27
" " 8		1	.	.	.	.	.	1	154,906	38 73
" " 9		1	.	.	.	.	.	1	180,191	45 04
" " 10		1	.	.	.	.	.	1	113,033	28 26
" " 12		1	.	.	.	.	.	1	119,168	29 79
" " 13		1	.	.	.	.	.	1	65,363	16 33
City Prison . . . . .		.	.	1	.	.	.	1	615,075	153 77
L. W. Morrill & Co.	Rotary Fan . . . . .	.	1	.	.	.	.	1	88,880	22 22
John C. Miller . . . . .	" . . . . .	.	1	.	.	.	.	1	509,963	127 48
First Church	Organ . . . . .	.	.	.	.	.	1	1	166,840	41 70
King's Chapel . . . . .	" . . . . .	.	.	.	.	.	1	1	51,865	12 96
Cathedral of the Holy Cross . . . . .	" . . . . .	.	.	.	.	.	2	2	208,815	52 20
Trustees Masonic Building . . . . .	" . . . . .	.	.	.	.	.	1	1	20,000	5 00
St. Mary's Church . . . . .	" . . . . .	.	1	.	.	.	.	1	611,505	152 87
<i>Amount carried forward</i>									809,204,171	\$202,295 07

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									809,204,171	\$202,295 07
Tremont-st. M. E. Church .	Organ	1						1	91,613	22 91
South Cong'l Church . . .	"						2	2	112,830	28 20
First Universalist Church .	"						1	1	344,027	85 98
Columbus-av. Univ. Church	"	1						1	52,959	13 23
Shawmut Cong'l Society . .	"		1					1	134,250	33 55
Church of the Holy Redeemer	"	1						1	103,763	25 93
Church of the Immaculate Conception	"						1	1	507,916	126 97
Clarendon-st. Baptist Church	"						1	1	94,406	23 59
Second Church Society . .	"						1	1	92,432	23 10
St. James Church	"						1	1	190,175	47 54
Brattle-street Church . . .	"						1	1	Not using.	
J. Montgomery Sears . . .	"						1	1	7,470	1 87
Mason & Hamlin	"						1	1	Not using.	
Boston Soc'y New Jerusalem	"						1	1	114,885	28 70
Second Hawes Unit. Soc'y .	"	1						1	83,498	20 87
Old South Church Society .	"						1	1	266,130	66 53
Trinity Church Society . .	"						2	2	319,978	79 98
German Catholic Church .	"						1	1	178,500	44 62
Boston & Albany R.R. Co.	Grain Elevator .	1						1	439,794	109 93
Shawmut Elevator Co . . .	" "	1						1	362,271	90 55
Bancroft & Dyer	Elevator	1						1	637,161	159 28
John L. Gardner	"		1					1	78,075	19 52
Job F. Bailey	"		1					1	601,193	150 29
George O. Hovey	"			1				1	49,275	12 31
E. Williams	"						1	1	128,250	32 06
Sidney Squires	"		1					1	210,563	52 64
Henry G. Denny	"						1	1	13,388	3 34
William Claflin (6 mos.) . .	"			1				1	10,575	2 64
Mrs. S. S. Dunn, est. . . .	"		1					1	7,823	1 95
Joel Goldthwait & Co. . . .	"	1						1	13,988	3 49
Chickering & Sons	"						2	2	1,596,000	399 00
Odd Fellows' Building . .	"						1	1	88,500	22 12
Davis & Co.	"						1	1	390,000	97 49
L. Beebe & Sons	"						1	1	1,191,750	297 93
<i>Amount carried forward</i>									817,717,609	\$204,423 18

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward.</i>									817,717,609	\$204,423 18
A. W. Clapp	Elevator						1	1	1,008,000	252 00
Rufus Gibbs & Co.	"						1	1	57,750	14 43
James Tucker & Co.	"						1	1	535,500	133 87
Lamkin & Foster	"						1	1	1,182,750	295 68
E. H. Sampson	"						1	1	537,000	134 25
Davis, Whitecomb, & Co.	"						1	1	449,250	112 30
J. C. Haynes	"						1	1	431,250	107 81
Lewis, Brown, & Co.	"						1	1	1,353,750	338 44
Claffin & Thayer	"						2	2	1,238,925	309 72
McConnell & Gardner	"						1	1	490,500	122 62
W. E. Putnam & Co.	"						1	1	795,751	198 93
Henry Bond & Co.	"						1	1	907,500	226 87
J. S. Stone	"						1	1	855,750	213 93
Dennison & Co.	"						1	1	1,497,000	374 24
H. H. Mawhinney & Co.	"						1	1	1,387,500	346 88
Clement & Colburn	"						1	1	339,000	84 75
Rhodes & Co.	"						1	1	741,000	185 25
Smith, Richardson, & Bates	"						1	1	1,210,500	302 62
Henry A. Gould	"						1	1	999,450	249 86
John Cummings & Co.	"						1	1	1,029,000	257 25
Mitchell, Green, & Stevens	"						1	1	Not using.	
Mrs. H. W. Harris	"						1	1	886,500	221 62
Mrs. Harris	"						1	1	Not using.	
Josiah Cummings	"						1	1	Not using.	
Hotel Westminster	"						1	1	399,000	99 75
Hotel Warwick	"						1	1	867,750	216 92
Hotel Lyndeboro'	"						1	1	1,799,550	449 88
Hotel Clifford	"						1	1	1,350,000	337 49
Hotel Berwick	"						2	2	2,008,661	502 16
Hotel Edinburgh	"						1	1	1,485,000	371 25
H. & D. W. Watrous	"						1	1	208,650	52 16
J. Montgomery Sears	"						2	2	864,675	216 16
Mrs. J. Longley	"						1	1	42,991	10 74
J. B. Kimball & Co.	"						1	1	502,500	125 63
<i>Amount carried forward.</i>									845,180,012	\$211,283 64

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									845,180,012	\$211,288 64
First National Bank	Elevator						1	1	5,211,225	1,302 80
Notman & Campbell	"						1	1	191,772	47 93
Martin, Skinner, & Fay	"						1	1	662,250	165 55
A. A. Pope & Co.	"						1	1	471,375	117 84
A. Storrs & Co.	"						1	1	468,150	117 04
Abram French & Co.	"						1	1	713,175	178 28
Talbot, Wilmarth, & Co.	"						1	1	328,500	82 12
Albert Metcalf	"						1	1	50,250	12 55
Edward Spaulding	"						1	1	179,250	44 81
Withington & Hall	"						1	1	195,000	48 75
Josiah Cummings	"						2	2	270,600	67 64
Fairbanks & Brown	"						1	1	748,200	187 04
Grosvenor & Richards	"						1	1	302,250	75 56
W. E. Underwood	"						1	1	296,573	74 15
George D. Howe	"						2	2	1,350,338	337 57
Lord, Whittemore, & Co.	"						2	2	418,140	104 54
Converse & Stanwood	"						1	1	306,450	76 61
John F. Mills, estate	"						1	1	1,491,000	372 75
Daniels, Badger, & Co.	"						1	1	455,250	113 80
Wright, Worster, & Delano	"						1	1	667,050	166 75
Hotel La Fayette	"						1	1	1,562,250	390 56
Hotel Baldwin	"						1	1	1,106,250	276 56
Doll & Richards	"						1	1	516,450	129 10
S. G. Allen (7 mos.)	"						1	1	300,975	77 49
Thomas Groom (7 mos.)	"						1	1	234,375	58 59
Monks & Co. (7 mos.)	"						2	2	1,020,975	255 24
Enoch Page (4 mos.)	"						1	1	10,110	2 53
F. R. Sears (4 mos.)	"						1	1	19,650	4 91
Lawrence Building (4 mos.)	"						1	1	823,425	205 85
S. D. Warren (3 mos.)	"						1	1	142,110	35 53
Howe Bros. (3 mos.)	"						2	2	96,375	24 09
Dyer, Taylor, & Co. (2 mos.)	"						1	1	341,400	85 35
Henry Bond (2 mos.)	"						1	1	271,500	67 87
David Parker & Co. (2 mos.)	"						2	2	26,850	6 71
<i>Amount carried forward</i>									866,438,505	\$216,603 10

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									866,438,505	\$216,603 10
Howard Nat'l Bank (1 mon.)	Elevator . . .						2	2	182,700	45 67
Sidney Bartlett (1 mon.) . .	"						1	1	12,900	3 22
Perry, Wendall, Fay, & Co.	"						1	1	602,250	150 56
Continental Bank Building .	"						1	1	2,158,650	539 65
C. D. Swain & Co.	"						1	1	179,250	44 80
J. A. & W. Bird	"						1	1	1,254,750	313 68
A. Wentworth	"						1	1	149,625	37 41
Atlantic National Bank . .	"						1	1	723,670	180 91
R. E. Aphthorp	"						1	1	3,074,775	768 69
F. Gordan Dexter	"						2	2	1,235,850	308 95
Banfield, Forristall, & Co. .	"						1	1	1,779,450	444 85
J. & J. Dobson	"						1	1	222,750	55 68
Robbins & Kellogg	"						1	1	683,700	170 92
Fogg, Houghton, & Coolidge	"						1	1	638,250	159 56
Horswell, Kinsley, & French	"						1	1	413,325	103 33
J. T. Bailey	"						1	1	74,251	18 54
Z. A. Willard	"						2	2	459,811	114 94
F. M. Johnson	"						1	1	2,048,419	512 10
Minot, Hooper, & Co. . . .	"						1	1	2,047,200	511 80
J. P. Paine	"						1	1	662,928	165 71
Miss C. D. Brewer	"						1	1	31,936	7 98
J. M. Beebe	"						1	1	11,213	2 79
John Holman	"						1	1	269,025	67 26
Paul & Co.	"						2	2	299,400	74 84
Oliver Ditson & Co.	"						1	1	872,925	218 22
W. H. Slocum	"						2	2	491,925	122 97
Charles H. Ward	"						1	1	369,150	92 29
Doe & Hunnewell	"						2	2	672,750	168 18
J. Cottle	"						2	2	202,050	50 50
A. A. Lawrence	"						2	2	6,402,225	1,600 55
David Parker & Co.	"						2	2	765,675	191 42
Joseph Peabody	"						1	1	85,725	21 42
S. N. Brown, Jr.	"						1	1	62,671	15 65
F. O. White	Motor						1	1	71,250	17 80
<i>Amount carried forward</i>									895,650,929	\$223,905 94

Name.	Class.	5-8 inch.	1 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>									895,650,929	\$223,905 94
L. W. & H. F. Morse . . .	Moter						1	1	36,000	9 00
Cedar Grove Cemetery . .	Cemetery . .				1			1	1,560,200	156 01
Forest Hills Cemetery . . .	"				1			1	1,581,900	158 19
Paul Knowles and others .	Marine Watermen, as per contract . . .				3			3	1,708,727	1,366 93
Totals									900,537,756	\$225,596 07

Statement showing the number of houses, stores, steam-engines, etc., in the City of Boston, supplied with water to the 1st of January, 1879, with the amount of water-rates received for 1878 :—

32,054 Dwelling-houses	\$485,424 73
27 Boarding-houses	1,319 33
1,436 Model-houses	36,336 25
15 Lodging-houses	483 50
13 Hotels	809 58
6,023 Stores and shops	65,093 36
488 Buildings	23,118 00
868 Offices	7,783 30
38 Public Halls	680 55
2 Museums	100 00
37 Private schools	683 50
22 Asylums	1,532 50
5 Hospitals	269 00
64 Greenhouses	1,557 00
136 Churches	2,175 52
8 Market-houses	1,203 50
100 Cellars	651 75
866 Restaurants and saloons	19,501 78
16 Club-houses	313 00
30 Photographers	940 66
34 Packing-houses	1,338 68

Amount carried forward,

\$651,315 49

<i>Amount brought forward,</i>		\$651,315 49
1,741 Stables		13,293 32
51 Factories		1,886 92
5 Bleacheries		117 50
121 Bakeries		1,224 83
10 Freight-houses		252 00
3 Gasometers		48 00
1 Cemetery		10 00
2 Bath-houses		50 00
3 Ship-yards		51 00
3 Dry-docks and engines		100 00
171 Shops and engines		8,179 69
23 Factories and engines		1,205 10
12 Printing and engines		923 88
2 Foundries and engines		118 50
3 Ship-yards and engines		66 25
1 Bakery and engine		39 00
29 Stationery engines		2,055 76
57 Discharging and pile-driving engines		678 00
10 Armories		168 17
1,496 Hand-hose		9,600 00
9 Fountains		120 00
34 Tumbler-washers		510 00
89 Beer water-pressures		445 00
40 Laundries		1,036 50
1 Gymnasium		50 00
8 Aquariums		50 00
18 Railroad stations		277 25
66 Steam and Tug Boats		9,510 80
12 Motors		60 83
1 Laboratory		50 00
3 Police Stations		77 50
44 Fire-engines, hose, and hook and ladder houses		965 00
7 Chemical engine-houses		105 00
3,822 Fire hydrants		68,796 00
129 Reservoirs		2,322 00
Repair shop		38 50
Steamer "Wm. M. Flanders"		200 00
Steamer "J. P. Bradlee"		200 00
Steamer "Samuel Little"		100 00
Steamer "Protector"		100 00
Public Schools		3,742 00
Boston Truants Home		120 00
Street watering		699 44

Amount carried forward,\$780,959 23

<i>Amount brought forward,</i>	\$780,959 23
Paving Department	431 50
Internal Health Department . .	1,101 25
Common Sewer Department . .	250 00
Lamp Department	42 25
Board of Health	490 00
Committee on Common and Squares .	385 00
Committee on Bridges	82 00
Committee on Bathing	15 00
Filling cisterns	13 00
Commercial College	61 50
Ice Company (washing ice) . .	15 00
Custom House	85 00
Branch Libraries	60 50
Building purposes	1,623 01
Maintaining meters	283 00
Metered water (9 months) . . .	167,059 58
	<hr/>
	\$952,956 82

The following table exhibits the yearly increase of water-takers since January 1, 1850 : —

			Takers.	Increase.
From January 1, 1850, to January 1, 1851,			13,463	
"	"	1851,	" 1852,	16,076 2,613
"	"	1852,	" 1853,	16,862 786
"	"	1853,	" 1854,	18,110 1,308
"	"	1854,	" 1855,	19,193 1,023
"	"	1855,	" 1856,	19,998 805
"	"	1856,	" 1857,	20,806 808
"	"	1857,	" 1858,	21,602 796
"	"	1858,	" 1859,	22,414 812
"	"	1859,	" 1860,	23,271 857
"	"	1860,	" 1861,	24,316 1,045
"	"	1861,	" 1862,	25,486 1,170
"	"	1862,	" 1863,	26,289 803
"	"	1863,	" 1864,	26,851 562
"	"	1864,	" 1865,	27,046 195
"	"	1865,	" 1866,	27,489 443
"	"	1866,	" 1867,	27,754 265.
"	"	1867,	" 1868,	28,104 350
"	"	1868,	" 1869,	29,738 1,634
"	"	1869,	" 1870,	31,500 1,762
"	"	1870,	" 1871,	36,132 4,632
"	"	1871,	" 1872,	38,716 2,584
"	"	1872,	" 1873,	40,688 1,972
"	"	1873,	" 1874,	42,345 1,657

			Takers.	Increase.
From January 1, 1874, to January 1, 1875,			44,676	2,331
“ “ 1875, “ 1876,			46,885	2,209
“ “ 1876, “ 1877,			48,328	1,443
“ “ 1877, “ 1878,			49,970	1,642
“ “ 1878, “ 1879,			51,523	1,553

The following table exhibits the yearly revenue from the sale of Cochituate water since its introduction into the city, October 25, 1848:—

Received by Water Commissioners, as per

Auditor's Report in 1848				\$972 81
From January 1, 1849, to January 1, 1850 .				71,657 79
“ “ 1850, “ 1851 .				99,025 45
“ “ 1851, “ 1852 .				161,052 85
“ “ 1852, “ 1853 .				179,567 39
“ “ 1853, “ 1854 .				196,352 32
“ “ 1854, “ 1855 .				217,007 51
“ “ 1855, “ 1856 .				266,302 77
“ “ 1856, “ 1857 .				232,651 84
“ “ 1857, “ 1858 .				289,328 83
“ “ 1858, “ 1859 .				302,409 73
“ “ 1859, “ 1860 .				314,808 97
“ “ 1860, “ 1861 .				334,544 86
“ “ 1861, “ 1862 .				365,323 96
“ “ 1862, “ 1863 .				373,922 33
“ “ 1863, “ 1864 .				394,506 25
“ “ 1864, “ 1865 .				430,710 76
“ “ 1865, “ 1866 .				450,341 48
“ “ 1866, “ 1867 .				486,538 25
“ “ 1867, “ 1868 .				522,130 93
“ “ 1868, “ 1869 .				553,744 88
“ “ 1869, “ 1870 .				597,328 55
“ “ 1870, “ 1871 .				708,783 68
“ “ 1871, “ 1872 .				774,445 70
“ “ 1872, “ 1873 .				862,704 08
“ “ 1873, “ 1874 .				917,415 92
“ “ 1874, “ 1875 .				977,020 48
“ “ 1875, “ 1876 .				1,005,120 94
“ “ 1876, “ 1877 .				1,029,643 70
“ “ 1877, “ 1878 .				1,015,562 89
“ “ 1878, “ 1879 .				1,010,584 30
“ “ 1879, to May 1, 1879 .				722,647 68

\$15,914,159 88

DRINKING-FOUNTAINS.

There are 52 drinking-fountains now established within the city limits : —

CITY PROPER.

*Boston Common (6).

North square.

Washington street, near Elm.

“ “ opposite Blackstone square.

Atlantic avenue, junction Commercial street.

“ “ head of Rowe's wharf.

“ “ near N.Y. and N. E. R.R. freight-house.

Haymarket square.

Causeway street, at Boston & Lowell R.R. depot.

“ “ junction Merrimac street.

Charles street, opposite the jail.

“ “ between Boylston and Beacon streets.

“ “ near Boylston street.

Beacon street, near Charles street.

Tremont street, near Clarendon street.

Albany street, opposite Water Works, pipe-yard.

Mt. Washington avenue, near the drawbridge.

EAST BOSTON.

Maverick square.

Central square.

Bennington street, junction Chelsea street.

SOUTH BOSTON.

Foundry street, opposite First street.

Fourth street, near Foundry street.

“ “ junction Emerson street.

“ “ corner of Q street.

Telegraph Hill.

Washington Village, junction Dorchester avenue and Dorchester street.

ROXBURY.

Albany street, junction Dearborn street.

Beacon street, junction Brookline avenue.

*Eliot square.

Eustis street, near Washington street.

Those marked * are arranged for a continuous flow of water. The balance have automatic fixtures, operating the flow of water when required.

Heath street, near Tremont street.
Pyncheon street, near Roxbury street.
Tremont street, junction Cabot street.

WEST ROXBURY.

Centre street, junction Day and Perkins streets.
Centre and La Grange streets, West Roxbury village.
Morton street, junction South street.
Roslindale, Taft's Hotel.
Washington, near Williams street.

DORCHESTER.

Commercial street, opposite Beach street.
Neponset avenue, corner Walnut street.
Upham's Corner.
Glover's Corner.
Grove Hall.

BRIGHTON.

Barry's Corner.
Market street, Cattle Fair Hotel.
Union square.
Western avenue, Charles-river Hotel.

There are eighteen stand-pipes now located for street-sprinkling purposes as follows: —

Tremont and Hammond park.
Clay, corner Tremont street.
Eliot square.
Brookline avenue, corner Longwood avenue.
St. James street, corner Warren.
Blue Hill avenue, between Waverley and Clifford streets.
Warren street, corner Gaston.
Egleston square, corner Walnut avenue.
Dale street, corner Walnut avenue.
Dudley street, opposite Harvard avenue.
Upham's Corner.
Field's Corner.
Dorchester avenue, near Savin Hill avenue.
Dorchester avenue, at old Boston line.
Beach street, Harrison square.
Union square, Brighton.
Washington street, corner of Winship, Brighton.
Chestnut Hill avenue, corner of South street.

Statement showing the number and kind of water fixtures contained within the premises of Water takers in the City of Boston, January 1, 1879, as compared with previous years.

1876.	1877.	1878.	Remarks.
8,269	8,386	8,716	Taps. These have no connection with any drain or sewer.
77,111	80,340	81,842	Sinks.
39,764	41,359	43,044	Wash-hand basins.
13,690	14,300	15,121	Bathing-tubs.
22,703	22,704	24,956	Pan water-closets.
1,875	1,038	777	Hopper-water closets.
19,912	20,680	22,006	“ “ automatic.
557	539	619	“ “ waste.
1,545	1,433	1,478	Urinals.
2,043	2,307	2,226	“ automatic.
15,990	16,608	17,517	Wash-tubs. These are permanently attached to the building.
629	598	534	Shower-baths
286	263	237	Private hydrants.
830	850	853	Slop-hoppers.
110	106	125	Foot-baths.
205,314	211,516	220,051	

Respectfully submitted,

WM. F. DAVIS,
Water Registrar.

REPORT OF THE CLERK.

OFFICE OF THE BOSTON WATER BOARD,
BOSTON, May 1, 1879.

HON. TIMOTHY T. SAWYER,
Chairman of the Boston Water Board:—

SIR,—The following is a statement of the receipts and expenditures of the Boston Water Board for the financial year ending April 30, 1879:—

RECEIPTS.

On account of Cochituate Water Works .	\$1,080,479 57
“ “ Additional Supply of Water . . .	9,874 21
“ “ Mystic Water Works . . .	268,701 10
“ “ Mystic Sewer	422 81
	<hr/>
	\$1,359,477 69
Balance of loans unexpended April 30, 1878, Additional Supply of Water	\$94,856 72
Mystic sewer	124,290 57
New loans, Additional Supply of Water	600,000 00
Appropriation, Chestnut-Hill Driveway, 1878-79	4,000 00
	<hr/>
	823,147 29
	<hr/>
	\$2,182,624 98

EXPENDITURES.

Current expenses, Cochituate Water Works	\$166,293 06
Current expenses, Mystic Water Works	72,308 20
Extension of Cochituate Water Works	62,438 70
	<hr/>
<i>Amounts carried forward,</i>	\$301,039 96
	<hr/>
	\$2,182,624 98

<i>Amounts brought forward,</i>		\$301,039 96	\$2,182,624 98
Extension of Mystic Water Works	25,522 74		
Stock on account Cochituate Water Works not used . .	8,322 59		
Stock on account Mystic Water Works not used . .	7,915 63		
Interest on Cochituate water loans	617,378 20		
Interest on Mystic water loans, East Boston contract, account Cochituate Water Works .	48,851 11		
Chelsea, Somerville, and Everett contracts, account Mystic Water Works . .	23,794 62		
Construction, Additional Supply of Water	635,658 08		
Construction, Mystic Sewer, Surplus Income to Cochituate Water Sinking Fund, .	25,508 93		
Surplus Income to Mystic Water Sinking Fund . .	187,070 12		
Chestnut-Hill Driveway . .	146,555 22		
Balance of appropriation Chestnut-Hill Driveway carried into the Treasury April 30, 1879	3,336 39		
	663 61		
	<hr/>		\$2,099,644 70
			<hr/>
			\$82,980 28
			<hr/>
April 30, 1879, Balance of Loans unexpended, Additional Supply of Water . .	\$59,198 64		
Mystic Sewer	23,781 64		
	<hr/>		\$82,980 28
			<hr/>

Total Water Debt of the City of Boston.

Cochituate, outstanding April 30, 1879	\$11,753,273 98	
Mystic, outstanding April 30, 1879	1,153,000 00	
	<hr/>	\$12,906,273 98
		<hr/>

Cochituate Water Debt.

Outstanding, April 30,		
1878	\$11,545,273	98
Issued in 1878-79	600,000	00
	<hr/>	
	\$12,145,273	98
Paid in 1878-79	392,000	00
	<hr/>	
	\$11,753,273	98

Mystic Water Debt.

Outstanding, April 30,		
1878	\$1,228,000	00
Paid in 1878-79	75,000	00
	<hr/>	
	\$1,153,000	00
	<hr/>	
	\$12,906,273	98
	<hr/>	

Total Water Sinking Funds, April 30, 1879.

Cochituate Water Sinking		
Fund	\$2,143,847	85
Mystic Water Sinking Fund	252,380	48
	<hr/>	
	\$2,396,228	33
	<hr/>	

Cost of Construction of the Cochituate Water Works to May 1, 1879.

Cost of Water Works to January 1, 1850, as per final report of Water Commis- sioners	\$3,998,051	83
Extension to East Boston	281,065	44
Jamaica-pond aqueduct	13,237	50
New dam at Lake Cochituate	10,940	08
Raising Lake two feet, including damages .	28,002	18
Dudley pond, lower dam, and making con- nections with lake	18,982	23
New main from Brookline reservoir . . .	304,991	83
Land and water rights and land damages since January 1, 1850	49,486	17
New pipe-yard and repair-shop	25,666	51
	<hr/>	
Amount carried forward,	\$4,730,423	77

<i>Amount brought forward,</i>	\$4,730,423 77
Upper yard, buildings, etc.	9,165 63
New water-pipes, East Boston	20,999 43
New main, East Boston	24,878 08
Pumping-works at Lake Cochituate	15,000 00
High-service, stand-pipe, engine-house and engines	103,829 53
High-service, South Boston	27,860 29
Chestnut-Hill reservoir, including land	2,449,982 07
Parker-Hill reservoir	228,246 17
Charles-river siphon	26,532 35
Keeper's house, Parker Hill	2,764 90
Temporary high-service, Brighton	7,865 86
New stable at Chestnut-Hill reservoir	8,103 55
Additional supply of water, including land damages and all expenses	5,001,986 46
Cost of laying main-pipe since January 1, 1850	1,644,522 72
Cost of laying main-pipe for extension in Roxbury, Dorchester, Brighton, and West Roxbury Districts	1,758,512 22
	<hr/>
	\$16,060,673 03

Respectfully submitted,

W. E. SWAN,
Clerk of the Boston Water Board.

REPORT OF THE MYSTIC WATER REGISTRAR FOR THE YEAR 1878-9.

OFFICE OF THE MYSTIC WATER REGISTRAR,
BOSTON, CHARLESTOWN DISTRICT,

May 1, 1879.

HON. TIMOTHY T. SAWYER,

Chairman Boston Water Board:—

SIR, — The Annual Report of the Mystic Water Registrar, for the year ending April 30, 1879, is herewith respectfully submitted.

The total number of water-takers now entered for the year 1879 is 20,025, distributed as follows: Charlestown District, 6,192; East Boston, 4,073; Chelsea, 4,590; Somerville, 4,437; Everett, 733.

The total amount of water rates received from May 1, 1878, to May 1, 1879, is as follows:—

Charlestown District	.	.	.	.	.	\$101,977 61
East Boston "net"	.	.	.	.	.	48,851 11
Chelsea	.	.	.	.	.	50,777 58
Somerville	.	.	.	.	.	55,372 57
Everett	.	.	.	.	.	7,466 55
						<hr/>
						\$264,445 42

There has been paid the cities of Chelsea, Somerville, and town of Everett, as per contract, the sum of . . . \$23,794 62

There has been received, for water used in previous years, the sum of . . . 11,832 24

Leaving the net receipts for water furnished during the year . . . 228,818 56

\$264,445 42

Amount carried forward,

\$264,445 42

<i>Amount brought forward,</i>	\$264,445 42
In addition to the above amount, there has been received, for extra work on service-pipes, including material furnished, the sum of .	\$770 97
Fines, non-payment . . .	380 00
Fees for summons . . .	277 50
Off and on water . . .	113 00
Maintaining meters . . .	145 00
	<hr/> 1,686 47
Total amount received during the year .	\$286,131 89

The expenses of the office during the year ending April 30, 1879, including all charges for collection in Chelsea, Somerville, and Everett, was \$6,198.24.

Table showing the number of places turned off for non-payment of rates during the year, the number turned on again, and the number still remaining off.

	Number turned off.	Number turned on.	Number remain- ing off.
Charlestown District	140	122	18
Chelsea	185	116	69
Somerville	121	95	26
Everett	17	10	7
Total	463	343	120

The places turned off for non-payment of rates in East Boston are included in the report of the Water Registrar of the Cochituate Water Department.

STAND-PIPES FOR STREET WATERING.

The whole number in use in this department is 21, distributed as follows :—

Charlestown District.

Cambridge street, near Stickney & Poor's factory.
 " " " Railroad
 Monument square, near Laurel street.

Chelsea.

Cary square, corner Forsyth street.

Somerville.

Washington street, corner Boston street.
 " " " Myrtle street.
 " " near Union square.
 Summer " " Elm street.
 " " " Laurel street.
 Somerville avenue " Poplar street.
 " " " Cambridge line.
 " " " Merriam street.
 Broadway " Franklin street.
 " opposite Public park.
 School street, near Somerville avenue.
 Spring " " Somerville avenue.
 Beacon " " Cooney street.
 Pinckney " " Pearl street.
 Pearl " " Cross street.
 Thurston " " Broadway.
 Highland avenue, corner Medford street.

DRINKING-FOUNTAINS.

The whole number in use in the Mystic Department is 24,
 distributed as follows :—

Charlestown District.

City square, corner Park street.
 Chelsea street, corner Wapping street.
 Bunker Hill street, corner Tufts street.
 Canal " " South Elm street.
 Main " " Hancock square.
 " " near Tufts wharf.
 Austin " opposite Front street.

Chelsea.

Broadway square.
 Broadway, near bridge.

Winnisimmet street, near the Ferry.
 Pearl street, corner Marginal street.
 Eastern avenue.

East Boston.

Maverick square.
 Central square.
 Bennington street, junction Chelsea street.

Somerville.

Union square (2).
 Broadway, corner Walnut street.
 Highland avenue, corner Walnut street.
 Medford street " Central street.
 Broadway Public Park.
 Davis square (2).

Everett.

Main street, junction Broadway.

One of the fountains in Union square, one at the corner of Highland avenue and Walnut street, and one at Davis square, have automatic fixtures regulating the supply of water. The others are so arranged that the water flows continuously.

Table showing the Number and Size of Meters, also the Number of Motors in the Mystic Water Department.

	SIZE OF METERS.								Total.
	$\frac{5}{8}$ inch.	$\frac{3}{4}$ inch.	1 inch.	$1\frac{1}{2}$ inch.	2 inch.	3 inch.	4 inch.	Motors.	
Charlestown District . .	37	. . . .	20	1	17	3	4	2	84
East Boston	22	. . . .	24	. . . .	5	3	. . . .	. . . .	54
Chelsea . .	17	1	9	1	5	1	. . . .	1	35
Somerville .	9	2	9	2	2	. . . .	1	2	27
Everett . .	. . . .	1	3	1	2	. . . .	. . . .	. . . .	7
Total . . .	85	4	65	5	31	7	5	5	207

Table showing the Number of Dwelling-Houses, Families, Stores, etc., supplied with Mystic Pond Water.

	Dwelling Houses.	Families.	Stores and Saloons.	Manufac- tories.	Offices, Halls, and Clubs.	Churches.	Stables.	Public Schools.	Fire Hydrants.	Miscellane- ous.
Charlestown District.....	4,817	8,250	524	82	121	17	405	124	203	82
East Boston.....	3,529	5,797	245	16	13	10	168	76	288	16
Chelsea.....	3,711	4,924	302	59	66	12	331	57	136	52
Somerville.....	3,515	4,813	162	27	21	10	584	78	269	40
Everett.....	561	645	12	9	4	1	119	6	69	21
Total.....	16,133	24,429	1,245	193	225	50	1,607	341	965	211

Table showing the Number and Kind of Water Fixtures contained within the premises of Water-takers.

	Taps.	Sinks.	Wash-hand Basins.	Bath-Tubs.	WATER CLOSETS.						Urinals.	Wash-Tubs.	Hand Hose.	Private Hydrants.
					Pan.	Self-acting.	Hoppers.	Waste.	Automatic.	Stop-Hoppers.				
Charlestown District.....	1,455	9,575	1,699	789	1,303	2,376	58	34	96	11	70	689	289	55
East Boston.....	553	7,773	852	510	639	.....	17	26	1,768	4	20	176	56	22
Chelsea.....	820	5,825	1,293	803	1,108	1,372	51	33	65	3	38	412	252	18
Somerville	1,125	5,485	1,373	1,036	1,288	1,160	36	39	21	3	92	512	408	41
Everett	240	709	103	88	88	27	.....	1	1	.....	3	36	111	1
Total	4,193	29,367	5,320	3,226	4,426	4,935	162	133	1,951	21	223	1,825	1,114	137

METER STATEMENT.

The following table exhibits the class of premises to which Meters are attached, together with the amount of Revenue received during the year 1878.

Name.	Class.	1 inch.	1½ inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
CHARLESTOWN DISTRICT.										
United States of America	Navy Yard . . . . .	.	.	.	.	2	.	2	22,063,835	\$5,515 95
United States of America	Marine Barracks . . . . .	.	.	.	1	.	.	1	1,778,475	444 61
State of Massachusetts	State Prison . . . . .	.	.	.	.	1	.	1	10,142,625	2,535 65
Boston and Maine Railroad Co. . . . .	. . . . .	1	1	1	2	.	.	5	21,183,753	5,295 94
Eastern Railroad Co. . . . .	. . . . .	2	.	4	.	.	.	6	21,401,844	5,350 46
Fitchburg Railroad Co. . . . .	. . . . .	2	.	4	.	.	.	6	15,982,763	3,995 68
Boston, Lowell, and Nashua Railroad Co.	Elevator	1	.	.	.	.	.	1	62,295	15 56
Charlestown Gas Co.	Gas Works	2	.	1	.	.	3	3	2,640,278	660 06
Wm. T. Van Nostrand, Jr.	Brewery . . . . .	.	.	1	.	.	1	1	4,471,350	1,117 84
Waverley House	Hotel . . . . .	.	2	1	.	.	3	3	1,701,976	425 50
J. T. Hicks	Hall . . . . .	.	1	.	.	.	1	1	10,433	2 61
Ezra Chapin	Distillery . . . . .	.	1	.	.	.	1	1	818,664	204 66
Amount carried forward . . . . .	. . . . .	.	.	.	.	.	.	.	102,253,291	\$25,504 52

Name.	Class.	6 in.	8 in.	1 inch.	1½ inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>											102,258,291	\$25,564 52
CHARLESTOWN DISTRICT. — <i>Continued.</i>												
Oriental Oil Co.	Oil Works			1						1	873,292	218 32
Thomas Cunningham	Boiler Maker			2						2	1,203,241	300 80
Hallowell Granite Co.	Granite Works			1						1	181,543	45 37
J. Peck & Son	Salt Works			1						1	401,948	102 73
Tudor Company	Factory							1		1	615,000	153 76
Tucker Manufacturing Company	"							1		1	838,500	209 62
American Wood Preserving Co.	"					1				1	465,465	116 36
Geo. H. Buxton	Stable	1								1	170,394	42 60
M. Rogan	Hoisting Fixtures	1	1			1				3	280,923	70 23
S. A. Rogers	Stable	1								1	37,298	9 33
A. R. Davis	Factory	1								1	50,543	12 64
D. & H. Pattee	"	1								1	49,934	12 43
St. Francis De Sales Church	Organ							1		1	906,750	226 68
Davidson Rubber Co.	Factory			1						1	1,062,240	265 56
Kennan, French, & Co.	"			1						1	735,116	196 23
Merchants' Tobacco Company	"	1				1				2	875,825	218 94

[illegible]

Name.	Class.	Indicator.	Total.	Gallons.	Revenue.
<i>Amount brought forward</i>					\$29,973 23
CHARLESTOWN DISTRICT.—Continued.					
N. Y. Brintall	Stable	2		119,885,325	30 73
H. T. Meserve	Boarding	1		73,777	18 43
J. V. N. Stults	"	1		110,385	27 50
Cook, Rymes, & Co.	Machinist	1		555,233	138 81
Johnson & Young	Lobster Boiler	1		185,640	46 41
Union Methodist Society	Organ	1		85,830	21 46
Joseph Gahn	Restaurant	1		210,586	52 66
Peterson & Jameson	Water Boats	1		405,600	324 48
				121,635,411	\$30,633 80
CHELSEA SUPPLY.					
United States of America	Marine Hospital	1		814,380	203 59
United States of America	Naval Hospital	1		1,123,275	280 81
City Hotel	Hotel	1		162,876	40 71
Chelsea Gas Light Co.	Gas Works	1		366,217	91 55
Stephen Sibley	Laundry	1		1,890,325	470 07
Charles A. Campbell	Wharf	1		373,995	93 50
Kenney & Ballou	Brewery	1		637,942	159 48

Boston Elastic Fabric Co.	Factory	1	.	.	.	.	.	.	.	91,414	22 85
P. F. McDonough . . . . .	" . . . . .	.	.	.	.	.	.	1	.	433,358	108 33
Thomas L. Appleton	"	1	.	.	.	.	.	.	.	101,364	25 35
White, Peirce, & Co.	"	1	.	.	.	.	.	.	.	234,436	58 60
Thomas Cunningham	"	1	.	.	.	.	.	.	.	132,915	33 23
Farwell, Spooner, & Co. . . . .	" . . . . .	.	.	.	.	.	.	1	.	231,975	57 99
Henry Sawyer	"	1	.	.	.	.	.	.	.	112,285	28 07
L. L. Pease	Stable	1	.	.	.	.	.	.	.	234,188	58 55
John W. Bardlett	"	1	.	.	.	.	.	.	.	216,173	54 04
Lynn & Boston Railroad Company . . . . .	" . . . . .	.	.	.	.	.	.	1	.	641,663	160 41
H. P. Abbott	"	1	.	.	.	.	.	.	.	123,326	32 07
Union Park Stable	"	1	.	.	.	.	.	.	.	131,388	45 34
J. A. Tutien	"	1	.	.	.	.	.	.	.	117,150	29 28
Daniel Curry & Co.	Oil Works	2	.	.	.	.	.	.	.	1,325,302	331 33
Chapman & Soder	Factory	1	.	.	.	.	.	.	.	45,090	11 26
J. H. Wilkinson	Building . . . . .	.	.	.	.	.	.	1	.	226,443	56 61
Bisbee & Company	Foundry . . . . .	.	.	.	.	.	.	.	.	120,939	30 23
Rubber Manufacturing Co.	Factory . . . . .	.	.	.	.	.	.	1	.	106,928	26 73
Geo. B. Guild & Co.	Store . . . . .	.	.	.	.	.	.	.	1	43,750	10 94
Samuel Cabot, Jr.	Ammonia Works	1	.	.	.	.	.	.	.	72,637	18 17
George E. Downes	Salt Works	1	.	.	.	.	.	.	.	233,835	58 46
Magee Furnace Co.	Foundry . . . . .	.	.	.	.	.	.	1	1	1,106,708	276 67
<i>Amount carried forward</i>										11,497,277	\$2,874 22
										121,635,411	\$30,633 80

Name.	Class.	Gallons.								Revenue.	
		6 1/2 inch.	3 1/2 inch.	1 inch.	1 1/2 inch.	2 inch.	3 inch.	4 inch.	Indicator.	Total.	
<i>Amount brought forward . . . . .</i>	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	\$2,874 22
<i>CHELSEA SUPPLY. — Continued.</i>											\$30,633 80
Winnismet Ferry Co. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 . . . . .	. . . . .	1	6,243,023	1,560 75
Chelsea Oil Co.	Oil Works . . . . .	. . . . .	. . . . .	1 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	109,800	27 45
Hawthorn School . . . . .	. . . . .	. . . . .	1 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	324,750	81 19
										18,174,850	4,543 61
<i>SOMERVILLE SUPPLY.</i>											
W. K. Lewis Bros.	Pickles	1 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	2	537,623	143 40
Skilton, Foot, & Co.	"	1 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	437,510	109 38
Thomas Emerson . . . . .	" . . . . .	. . . . .	1 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	328,844	82 20
Amos Haynes	Vinegar Works	3 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	3	378,533	94 63
M. Durant & Son	"	1 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	289,868	72 46
Reitenbach Bros. & Mink	Factory . . . . .	. . . . .	. . . . .	1 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	447,988	111 99
Chas. H. North & Co. . . . .	" . . . . .	. . . . .	. . . . .	1	1 . . . . .	. . . . .	. . . . .	. . . . .	2	2,943,420	735 85
J. J. Clapp & Co.	Grain Mill . . . . .	. . . . .	1 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	33,716	9 63
Sylvester & Co.	Spike Foundry . . . . .	. . . . .	. . . . .	1 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	467,036	116 51
Union Hall Building Co.	Building . . . . .	. . . . .	1 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	687,030	171 75
Union Horse Railway	Stables	1 . . . . .	. . . . .	1 . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	2	435,493	108 88
J. H. Ferris	Saloon . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	103,313	25 82

American Tube Works	Tube Works	1	2	2	1,049,756	262 43
Middlesex Bleachery . . . . .	. . . . .	. . . . .	. . . . .	1	14,238,060	3,559 50
Somerville Flour Mills	Grain Mill	1	. . . . .	1	37,883	9 46
Fitchburg Railroad Co.	Paint Shop	1	. . . . .	1	133,725	33 42
Shepherd L. Pratt	Stable	1	. . . . .	1	269,881	67 47
Boston, Lowell, and Nashua Railroad Co.	Cattle Station	1	. . . . .	1	90,000	22 50
Bacon Hall	Building	1	. . . . .	1	306,991	76 75
Prescott School . . . . .	. . . . .	1	. . . . .	1	165,375	41 34
Somerville Journal	Printing Office	1	. . . . .	1	375,750	93 94
EVERETT SUPPLY.					23,762,785	5,949 36
A. Cochran & Co.	Chemical Works	2	1	3	3,983,673	995 92
David Washburn	Brick Yard	1	1	2	376,725	94 18
E. B. Spaulding	"	1	. . . . .	1	110,025	27 51
George A. Sammett	Greenhouses, etc.	1	. . . . .	1	183,278	45 82
Total . . . . .	. . . . .				4,653,701	1,163,43
					168,226,747	\$42,290 20

The East Boston meter accounts are included in the tabular statement in the report of the Water Registrar of the Cochituate Water Department.

Statement showing the amount of water-rates received since the introduction of Mystic-pond water, November 29, 1864:—

Charlestown District,	1865 . . .	\$27,079 10	
“ “	1866 . . .	47,323 16	
“ “	1867 . . .	60,188 83	
“ “	1868 . . .	68,815 32	
“ “	1869 . . .	74,369 81	
“ “	1870 . . .	82,230 79	
“ “	1871 . . .	84,318 71	
“ “	1872 . . .	98,445 91	
“ “	1873 . . .	99,470 66	
“ “	1874 . . .	111,420 30	
“ “	1875 . . .	118,568 00	
“ “	1876 . . .	116,271 17	
“ “	1877 . . .	109,963 25	
“ “	1878 . . .	104,174 76	
“ “	May 1, 1879 . . .	73,061 32	
		<hr/>	\$1,275,701 09
East Boston, net,	1870 . . .	39,870 22	
“ “	1871 . . .	45,022 98	
“ “	1872 . . .	49,574 38	
“ “	1873 . . .	53,488 41	
“ “	1874 . . .	53,654 08	
“ “	1875, 10 mos.	49,153 73	
“ “	1876 . . .	50,228 04	
“ “	1877 . . .	46,982 40	
“ “	1878 . . .	48,553 33	
“ “	May 1, 1879 . . .	39,270 33	
		<hr/>	475,797 90
Chelsea, net,	1868, 6 mos.	3,087 88	
“ “	1868-69 . .	16,615 92	
“ “	1869-70 . .	22,179 41	
“ “	1870-71 . .	25,871 17	
“ “	1871-72 . .	31,535 62	
“ “	1872-73 . .	34,067 65	
“ “	1873-74 . .	36,118 61	
“ “	1874-75 . .	39,886 61	
“ “	1875-76 . .	40,060 54	
“ “	1876-77 . .	39,425 33	
“ “	1877-78 . .	39,147 60	
“ “	May 1, 1879 . .	39,039 11	
		<hr/>	367,035 45
Somerville, net,	1869 . . .	5,586 73	
“ “	1870 . . .	11,211 40	
“ “	1871 . . .	17,023 74	
“ “	1872 . . .	21,220 11	
“ “	1873 . . .	25,698 11	
“ “	1874 . . .	30,494 48	
“ “	1875 . . .	38,038 70	
“ “	1876 . . .	39,320 47	
		<hr/>	
Amounts carried forward,		\$188,593 74	\$2,118,534 44

<i>Amounts brought forward,</i>			\$188,592 74	\$2,118,534 44
Somerville,	net	1877 . . .	39,411 22	
"	"	1878 . . .	41,648 79	
"	"	May 1, 1879 . . .	37,253 39	
			<hr/>	306,907 14
Everett,	net,	1872-73 . . .	3,062 83	
"	"	1873-74 . . .	3,710 96	
"	"	1874-75 . . .	3,975 95	
"	"	1875-76 . . .	4,982 52	
"	"	1876-77 . . .	5,566 12	
"	"	1877-78 . . .	6,291 70	
"	"	May 1, 1879 . . .	5,969 14	
			<hr/>	33,559 22
				<hr/>
The aggregate amount to May 1, 1879				\$2,459,000 80

Respectfully,

JOSEPH H. CALDWELL,
Mystic Water Registrar.

REPORT OF THE SUPERINTENDENT OF THE WESTERN DIVISION.

OFFICE WESTERN DIVISION,
BOSTON WATER WORKS,
C. H. RES. May 1, 1879.

HON. TIMOTHY T. SAWYER, *Chairman Boston Water Board*: —

SIR, — In compliance with the rules of the Board, I submit herewith the annual report of this department for the past official year.

LAKE COCHITUATE.

On May 1, 1878, the lake stood at elevation 134.10, 3 inches below high-water mark.

The surface was kept very nearly at this height during the whole year, by means of the connection with the Sudbury supply.

About three and a quarter billion gallons were received from this source.

The lowest point reached was on October 12, at which date the water stood at 131.73. It is now 133.78.

Waste over the dam was begun Nov. 22, and continued until Dec. 31, when the stop planks were put in. The depth of flow over the weir varied from 6 to 16 inches. On March 1 waste was again commenced and still continues.

It will be seen from the above that the surface of the lake has been kept higher than for a number of years past.

The meadows in consequence have been well covered, and the water has kept fully up to its old standard of purity.

No new works have been built at the lake during the year. The structures have been kept in repair and are nearly all in good order. Willow bridge will have to be rebuilt this season.

DUDLEY POND.

No water has been drawn from this pond during the year.

DUG POND

has furnished us with no water worth mentioning.

THE COCHITUATE AQUEDUCT.

On May 1, 1878, we were running this aqueduct under a head of nearly 2 feet. The water was kept over the arch at elevation 129.00, and was so maintained until December 1, when the surface was lowered to 128.00, and on March 16 another foot was taken off, so that the aqueduct is no longer run under a head to maintain the supply. One examination only has been made of the interior. On June 11 the water was drawn off and a number of engineering parties sent through. The general condition of the brick-work was found to be unchanged.

The portion on the high embankment at Newton Lower Falls, which I examined personally, was in much better condition than expected, and showed no great changes.

In addition to the engineering examination, a number of parties of laborers were sent through and the brick-work cleaned as thoroughly as possible.

SOUTH FRAMINGHAM, June 17, 1878.

MR. DESMOND FITZGERALD : —

DEAR SIR, — At your request I have examined the conduit from Lake Cochituate to Dedman's brook, and have to report as follows : —

The most noticeable change is at Stations 1 and 30, where there are two springs larger than any I have seen in the conduit. I was unable to determine whether they were throwing sand or not, on account of the large amount of sand in the vicinity. My impression was that they did *not* throw sand. With the exception of this place, the conduit is in as good condition as I have ever seen it. Some workmen were scraping the sides near the gate-house. I noticed after passing them that the vegetable growth had increased, and that it extended, although diminishing, nearly a mile from the gate-house. There were 3 or 4 inches of sand near the gate-house, and below the springs between Stations 7 and 8 ; with these exceptions, the sand was uniformly about one inch deep to Station 35.

Enclosed you will find a copy of notes taken, which include the measurements you desired. . . .

Respectfully yours,

F. P. STEARNS.

*Examination of Cochituate Conduit from the Lake to Dedman's
Brook, June 11, 1878.*

Stations.	Heights.	Widths.	Remarks.
			Entered conduit at 9 A.M.
0	6.21	5.09	
1	6.20	5.03	
1 + 30 . . .	6.17	5.01	Two very large springs, about three feet apart. There is a crack in the bottom and a very small one in the top. The bricks have settled at the second spring.
1 + 75 . . .	6.12	5.06	Spring in bottom, and small springs in side.
2	6.15	5.05	
3 + 20 . . .	.....	.....	Spring left side of invert; no sand.
6	6.25	5.01	
6 + 75 . . .	6.20	5.11	
7	6.21	5.09	
7 + 13 . . .	6.12	5.14	
7 + 16½ . . }			Three large springs, with sand below. They seem to have about the usual amount of force; crack in top.
7 + 18½ . . }	.....	.....
7 + 27 . . }			
7 + 25 . . .	6.05	5.25	
8 + 05 . . .	6.24	5.08	
12	6.28	5.06	
15	6.29	4.93	
17 + 30 . . .	.....	.....	Spring; no sand.
17 + 50 . . .	6.27	5.14	
17 + 80 . . .	6.42	4.98	Conduit very much distorted.
23 + 75 . . .	.....	.....	Large spring; no sand.
25	6.11	5.07	
25 + 05½ . .	5.92	5.07	Taken where the height was least.
26	6.24	5.07	
40	6.27	5.03	
56 + 25 . . .	.....	.....	Spring right side of invert; no sand.
66	6.21	5.19	
66 + 20 . . .	6.19	5.10	½" stream of water coming in at right side; a little sand below.
71 + 40 . . .	6.21	5.06	
71 to 73 . . .	.....	.....	A large number of springs enter at the sides between these stations, but they do not bring sand.
74 + 28 . . .	6.19	5.13	Large spring; no sand.
74 + 70 . . .	6.20	5.14	Spring in bottom; no sand.
87 + 75 . . .	.....	.....	Spring right side of invert; no sand.

Examination of Cochituate Conduit. — Continued.

Stations.	Heights.	Widths.	Remarks.
95 + 76 . . }			
95 + 90 . . }			
96 + 70 . . }	.....	.....	Springs in invert; no sand.
97 + 25 . . }			
97 + 50 to 98	.....	.....	Sand, a few inches deep.
116 + 20 . . .	6.52	5.07	
122 + 20 . . .	6.31	5.42	
141	6.37	5.06	
141 + 50 . . .	6.31	5.16	
142	6.32	5.17	
143	6.33	5.04	
154 + 50 . . .	6.32	5.09	No crack to be found near the waste weir.
155	6.37	5.12	

Arrived at Dedman's Brook at 2 P.M.
Time in conduit, 4 hours 10 minutes.

Report of Examination of Cochituate Conduit from Dedman's-Brook Waste Weir to Grantville Waste Weir, on June 11, 1878, by F. D. Fisher.

Began examination at Dedman's brook waste weir at 8.40 o'clock A.M.

Station.

155 + 95 to 156 + 25. — Fine crack in top of arch.

157 to 157 + 75. — Fine crack in top of arch.

157 + 30 to 158. — Fine crack in invert, left side.

158 + 10 to 158 + 30. — Fine crack in top of conduit — part of way two cracks.

167 + 10. — (Size, 6.33×5.20 .) Fine crack in top, left side.

From 158 to 167 the conduit is very clean and free from cracks.

167 + 90. — Fine crack in top of conduit.

168. — (Size, 6.35×5.15 .)

169. — (6.28×5.10 .) Crack in top begins.

- 168 to 169. — A good many roots growing through top of arch, some hanging down almost to the invert.
170. — Crack in top continues, has been pointed at some time, and has opened again.
- 170 + 25. — (About.) Crack in top ends.
- 171 + 50 to 172. — Old crack in top has started in places since it was pointed.
172. — (Size, 6.30×5.25 .)
173. — (Size, 6.33×5.12 .) Fine crack in top.
- 173 to 173 + 65. — $\frac{1}{8}$ -inch crack in right side of invert (was sometime pointed) — long roots in roof all the way.
174. — (Size, 6.20×5.30 .)
- 174 to 174 + 25. — Crack nearly $\frac{1}{8}$ -inch in roof right side. Smaller crack in right side of invert.
- 174 to 175. — Fine cracks and small roots in top most of way.
175. — Size, 6.27×5.21 .
- 175 to nearly 179. — Conduit in good condition.
179. — Size, 6.30×5.11 ; large crack in top, nearly $\frac{1}{8}$ -inch in places.
180. — Size, 6.36×5.08 ; large crack in top continues.
- 180 to 181. — Fine crack in top. Large root in top about 180 + 50, right side.
181. — Size, 6.37×5.10 .
182. — A few roots in top, each side of manhole.
- 182 + 50 to 183. — $\frac{1}{8}$ -inch crack in top right side; crack ends at 183 + 35 (fine).
183. — Size, 6.34×5.07 .
- 183 to 207. — Condition of conduit is very good.
- Manhole to 208. — Crack in top, varying from fine to $\frac{1}{8}$ -inch.
207. — Size, 6.31×5.05 .
208. — Size, 6.33×5.12 .
- 208 to 240. — Conduit in good condition.
- 240 + 50 to 241 + 20. — Fine crack in top.
246. — Fine crack in top for few feet each side of station.
246. — Size, 6.30×5.15 .
- 246 to 247. — Old pointing has not started open.
- 247 + 30 to 247 + 80. — Large crack in top, right side, over $\frac{1}{8}$ -inch.
- 247 + 50. — Size, 6.28×5.15 .
- 248 + 30 to 248 + 70. — Crack in top, left side.
- 253 to 253 + 70. — Crack in top, roots each side of manhole.
- 254 + 25 to 255. — Crack in top.
254. — Size, 6.23×5.22 .
255. — Size, 6.35×5.05 .
254. — At manhole, 6 inches of sand and long roots in top and bottom.

- 255 to 255 + 50. — Large crack in top.
 256. — Size, 6.35×5.07 .
 From 259. — About 30 feet eastward, small crack in top.
 267 + 20. — Considerable dripping from roof.
 283 + 64 to 284. — Crack in top.
 284 + 70 to 285 + 50. — $\frac{1}{8}$ -inch crack in top.
 294 + 20. — Large spring in invert; 8 inches of water in conduit, spring throws the water 4 or 5 inches above it.
 297. — Size, 6.21×5.10 .
 297 + 83. — Large spring on left side.
 297 + 95. — Smaller “ “ “ “
 298. — Large spring in middle of invert (size 6.33×5.08).
 298 + 05. — Smaller spring.

DIVISION II.

- 12 + 60. — Size, 6.17×5.12 .
 12 + 65. — Large spring in bottom.
 13. — Size, 6.20×5.20 .
 13 + 55. — Size, 6.09×5.22 .
 13 + 58. — Large spring bringing in a large quantity of sand (sand 6 inches deep at 13 + 58; 1 inch deep at 14).
 13 to 13 + 85. — $\frac{1}{8}$ -inch crack in top of conduit; $\frac{1}{4}$ -inch part of way.
 13 + 55 to 13 + 75. — $\frac{1}{4}$ -inch crack in bottom, left side, full of springs throwing up sand.
 16. — Size, 6.13×5.19 .
 16 to 16 + 35. — $\frac{1}{8}$ -inch crack in top.
 16 + 50. — Size, 6.25×5.11 .
 17. — Size, 6.20×5.08 .
 17 + 50. — Size, 6.20×5.07 .
 17 + 65. — Large spring on left of invert, bringing in considerable sand.
 17 + 65 to 18. — An old crack ($\frac{1}{8}$ to $\frac{1}{4}$ inch) in roof.
 18. — Size, 6.20×5.13 .
 18 + 50. — Size, 6.19×5.17 .
 18 + 75. — Old crack in roof ends here.
 30. — Considerable water coming in at manhole, and some gravel in conduit.
 30 + 25. — Size, 6.38×5.10 .
 42 + 50. — Near here — small crack in roof.

Terminated examination at Grantville Waste Weir at 3 o'clock, P.M.

F. D. FISHER.

Examination by D. Fitzgerald, from Station 100 to West Syphon Chamber, June 11, 1878.

102. — 6.35×5.03 .
 103. — 6.34×5.06 .
 104. — 6.347×5.06 .
 105. — 6.29×5.08 . — Height taken on cement on bottom.
 + 50. — Crack 10 feet long, $\frac{1}{8}$ -inch, worst place.
 106. — 6.28×5.07 .
 107. — 6.18×5.20 . — Old crack — left of centre, fine.
 6.03×5.30 . — Worst place between 107 and 108.
 108. — 6.03×5.46 . — From this station crack runs to centre; crack on bottom.
 108 + 60. — 6.11×5.34 .
 109. — 6.13×5.30 . — Crack still continues.
 109 + 03. — Cement soft on north side.
 109 + 80. — Crack ends.
 110. — $6.33 + 5.00$.

Examination of Cochituate Conduit, June 11, 1878, by Osgood Hodges, Assistant Engineer.

Station.	Size.	Remarks.
		Entered east Pipe Chamber at 8.45, A.M.
125	6.33×5.05	
130	6.34×5.00	
135	6.34×5.03	
137 + 20 — 137 + 50		Very sandy on bottom.
140	$\times 5.05$	Manhole.
145	6.36×5.04	
150	6.36×5.06	
155	6.34×5.05	
160	6.37×5.06	
160 + 15 — 160 + 50		Both sides of manhole cracked.
165	6.34×5.09	
169 + 30 — 170		Slight crack.
170	6.37×5.01	
175	6.33×5.04	
175 to 175 + 40		Slight crack; roots.
179 + 25 — 179 + 60		Slight crack in top.

Examination of Cochituate Conduit. — CONTINUED.

Station.	Size.	Remarks-
180	6.36 × 4.99	
183 + 50 . . . . .	. . . . .	Manhole cracked on west side.
185	6.33 × 5.09	
190	6.33 × 5.05	
193 + 40 . . . . .	. . . . .	Crack in right side of upper arch, about 3' long, diagonally to corners, which needs pointing.
195	6.37 × 5.01	
195 + 25 — 196 + 65 . . . . .	. . . . .	Slight crack in top.
196 + 50	6.32 × 5.09	
197	6.37 × 4.98	
197 + 50	6.35 × 5.06	
197 + 60 . . . . .	. . . . .	Slight crack in top and manhole.
200	6.33 × 4.98	
205	6.35 × 5.01	
205 — 206 . . . . .	. . . . .	Sand.
210	6.30 × 5.02	
215	6.33 × 5.02	
216 + 25 — 217 + 25 . . . . .	. . . . .	Crack in top.
217	6.31 × 5.02	
220	6.29 × 5.08	
221 + 30 — 222 + 05 . . . . .	. . . . .	Slight crack in top.
221	6.30 × 5.03	
222	6.30 × 5.12	
223	6.29 × 4.98	
224	6.30 × 5.03	
225	6.32 × 5.10	
223 + 60 — 225 + 30 . . . . .	. . . . .	Crack in top.
226 + 75 — 228 + 25 . . . . .	. . . . .	Crack in top.
227	6.30 × 5.04	
230	× 5.02	Manhole.
232 — 234 . . . . .	. . . . .	Crack in top, which has been repointed and not opened again.
233 + 50	6.28 × 5.11	
235	6.32 × 5.07	
240	6.30 × 5.05	
243 — 244 . . . . .	. . . . .	Several bad cracks; the repointing has not opened.
243	6.28 × 5.07	
243 + 75 . . . . .	. . . . .	Roots.
244	× 5.00	Manhole.

Examination of Cochituate Conduit. — CONTINUED.

Station.	Size.	Remarks.
245	6.31 × 5.06	
247 + 40 — 248		Slight crack in top.
250	6.32 × 5.07	
253 + 35 — 254 + 50		Bad crack.
253 + 50	6.31 × 5.06	
254	6.23 × 5.14	
255	6.37 × 5.04	
260	× 5.08	
263 + 50 — 0 + 15		Large crack in top.
263 + 50	6.31 × 5.04	
264	6.31 × 5.07	
0 + 90 — 2 + 75		Large crack in top.
1	6.29 × 5.07	
2	6.30 × 5.07	
5	6.38 × 5.00	
6 + 75 — 7		Slight crack in top.
Arrived at Newton Centre Waste Weir at 12.10, P.M.		

June 12, 1878.

DESMOND FITZGERALD, Esq.,

Supt. Western Division Boston Water Works: —

DEAR SIR, — At your request I yesterday examined the Cochituate Conduit from the Newton Centre Waste Weir to the Intermediate Gate-house at Chestnut-Hill Reservoir. The following notes show the changes and present condition of the portion examined: —

Station.	Size.	Remarks.
		Entered Conduit at 9.30, A.M., June 11, 1878
12	6.35 × 5.03	
15	6.30 × 5.06	
20	6.26 × 5.05	
22	6.27 × 5.03	
25	6.27 × 5.07	

Station.	Size.	Remarks.
27 + 50 . . . . .	. . . . .	Small crack in top, 5 feet long.
30	6.34 × 5.03	
30 + 10 . . . . .	. . . . .	Small stream on left side, near bottom; considerable force.
35	6.27 × 4.96	
37 + 50 . . . . .	. . . . .	Spring from between bricks, same as before reported.
40	6.32 × 5.06	
45	6.31 × 5.00	
49 + 44 . . . . .	. . . . .	Small crack, 49 + 44 to 49 + 61.
50	6.28 × 5.11	
50 + 75	6.23 × 5.18	The cracks between 50 and 52 are about the same.
51	6.23 × 5.12	I should think they had started a little.
52	6.23 × 5.17	3'' to 9'' of mud in tunnel.
85	6.30 × 5.03	
87	6.26 × 5.12	Reached ventilator at 12, M., and reëntered conduit at 12.10, P.M.
90	6.33 × 5.00	
90 + 60	6.32 × 5.05	
92	6.32 × 5.05	
93	6.28 × 5.10	
94	6.30 × 5.07	
98 + 28 . . . . .	. . . . .	Small crack on left side.
100	6.34 × 5.03	
105	6.34 × 5.03	
110	6.30 × 5.08	
116	6.33 × 5.14	The cracks between here and the gate-house have been pointed, and show no signs of change.
121	6.34 × 5.25	
123	6.28 × 5.10	
125	6.18 × 5.18	

DEXTER BRACKETT,
Assistant Engineer.

SUDBURY-RIVER AQUEDUCT.

This aqueduct was placed under my charge on Feb. 10th. A number of examinations have been made of the interior, and it has been found in excellent condition. The exterior is also in good order, considering the work has been so recently completed. Necessary repairs to the embankments, sodding, etc., are now making. A proper store-house should be built about midway of the line for storage of tools and materials required in maintenance.

By the completion of this aqueduct the Cochituate aqueduct has been relieved of pressure at its upper end.

CHESTNUT-HILL RESERVOIR.

A number of improvements have been made to the grounds and driveways of this reservoir during the past year. Some unsightly places have been graded, sown and planted. A capacious stone stable has been built in place of the temporary structure in which the horses have been kept hitherto. The stable was built by contract out of stone lying on the surrounding ground. It is a substantial structure in every respect. A cellar under the whole building allows manure to be made at a minimum cost, which is applied to the grass. The grounds disturbed by the construction of the additional supply have been put in good order. The construction of the terminal chamber was begun Aug. 26th, and completed in February. The intersection chamber connecting the two aqueducts, the Sudbury and Cochituate, was begun Aug. 15th and completed Sept. 20th. The masonry was thoroughly laid.

During the nights of Dec. 25th and 26th we were troubled with a large accumulation of anchor-ice, but fortunately the city was not deprived of water; the only actual damage done was to the circular screens in the effluent gate-house. Meteorological observations, together with observations on the evaporation from water and snow surfaces, have been kept, and the results sent to the City Engineer. The gate-houses and other structures are all in good order.

Table showing Rainfall at Chestnut-Hill Reservoir for 1878.

Date.	Inches.	Snow or rain.	Duration.	Date	Inches.	Snow or rain.	Duration.
Jan. 2	.01	Snow	10.30 p.m. to 2.30 a.m.	April 4	.16	Rain	7 p.m. to 7.30 a.m.
" 3				" 5			
" 4	.63	"	11.30 a.m. to 3 p.m.	" 6	.22	"	{ 9 a.m. the 5th to 4.45 p.m. the 6th.
" 10	2.27	Rain	2.50 p.m. to 11.45 p.m.	" 7	.18	"	{ 6 p.m. the 6th, to 2 p.m. the 7th.
" 11				" 11	.85	"	5.30 p.m. to 4.30 p.m.
" 14	1.02	"	3 a.m. to 4.15 p.m.	" 12			
" 20	.70	"	6.40 p.m. to 7.30 a.m.	" 22	.43	"	9 p.m. to 1 p.m.
" 21				" 23			
" 23	.12	"	3 to 8.15 a.m.	" 24	.01	"	
" 26	.88	"	4 a.m. to 3.45 p.m.	" 25	1.11	"	5 p.m. to 2.45 p.m.
" 27	.34	"	9.30 p.m. to 11 a.m.	" 26			
" 28				" 27	1.48	"	9.30 a.m. to 8 a.m. 29th.
" 31	3.00	Snow	4 p.m., to 5 p.m. Feb. 1.	" 28			
Total .	8.97	...	.....	" 29	.09	"	1.15 to 2 p.m., 4.30 p.m. to 10.30 a.m., 7.15 p.m. to 1 a.m., May 1.
				" 30	1.29 .13		
Feb. 8	.55	Rain	8.30 p.m. to 12.30 p.m.	Total .	5.95	...	.....
" 9							
" 10	.42	Snow	3 a.m. to 3.30 p.m.	May 5	.05	Rain	Showers in p.m.
" 17	.20	"	6.40 to 10 p.m.	" 20	.04	"	8.45 a.m. to 4 p.m.
" 21	.09	Rain	12.45 to 4.15 p.m. 8.40 p.m. 21st	" 21	.02	"	4 to 6.30 a.m.
" 22	2.70	"	to 4 a.m.	" 26	.06	"	10.10 to 11.45 a.m.
" 23				" 30	.62	"	8.15 a.m. to 4.15 p.m.
				" 31			
Total .	3.96	...	.....	Total .	.79	...	.....
Mar. 2	.55	Rain	10.30 p.m. to 11.30 a.m.	June 8	.51	Rain	2.30 p.m. to 3 a.m.
" 3				" 9			
" 11	.07	"	7 to 12 p.m.	" 10	.20	"	7.10 a.m. to 4 p.m.
" 12	1.73	"	{ 1 p.m. to 10.30 a.m. the 13th.	" 12	.04	"	1.05 to 2 p.m.
" 13	.05	"	{ 10 p.m. to 1 a.m. the 14th.	" 13	.06 .02	"	Showers in p.m. 3.40 to 4.30 p.m.
" 14	.03	Snow	11 p.m. to 2 a.m.	" 17			8 a.m. to 12.15 p.m.
" 15				" 18	.03	"	10 a.m. to 12.10 p.m.
" 17	1.87	Rain	2.15 p.m. to 3.30 p.m.	" 22	.99	"	12.10 to 4.45 p.m.
" 18				" 23	.07	"	3.15 to 4 p.m.
" 24	.08	"	12.10 to 3 p.m.	" 24	.09	"	Showers 6.05 p.m. to 7.15 a.m.
" 28	.55	"	1 p.m. to 10.30 a.m.	" 25			
" 29				" 27	.02	"	9.30 to 10 p.m.
Total .	4.93	...	.....	Total .	2.26	...	.....

Rainfall at Chestnut-Hill Reservoir. — CONTINUED.

Date.	Inches.	Snow or rain.	Duration.	Date.	Inches.	Snow or rain.	Duration.
July 9	1.23	Rain	2.30 to 5.30 p.m.	Oct. 8	.02	Rain	Showers in a.m.
" 10	.17	"	5.10 to 6.10 p.m.	" 9	.25	"	7 to 8.15 p.m.
" 12	.02	"	Showers.	" 12	2.67	"	6.15 a.m. to 1 a.m.
" 18	.02	"	1.30 to 4 a.m.	" 13		"	
" 21	.40	"	4.15 to 5.45 p.m.	" 19	.05	"	4 to 5 a.m.
" 27	.17	"	2 to 10.30 a.m.	" 23	1.78	"	10.45 a.m. to 3 a.m.
" 30	1.33	"	2.30 a.m. to 9.15 a.m.	" 24		"	
" 31				" 30	.52	"	7.20 a.m. to 6.30 a.m.
" 31				" 31		"	
Total .	3.34	...	.....	Total .	5.29	...	.....
Aug. 2	.20	Rain	2.45 to 6 p.m.	Nov. 7	.01	Snow	11.20 to 12 p.m.
" 4	.45	"	2.45 to 8 p.m.	" 12	.14	Rain	5 to 7.45 a.m.
" 6	.52	"	3.20 to 7.15 p.m.	" 17	3.36	"	8 p.m. to 5 a.m.
" 7	.10	"	4.10 to 4.50 p.m.	" 18		"	
" 8	1.38	"	10.20 p.m. to 2.30 a.m.	" 19		"	
" 9	1.18	"	5.40 to 10 p.m.	" 20	.31	"	9.30 a.m. to 5.15 p.m.
" 11	.02	"	4.15 to 5 p.m.	" 22	1.51	"	7.15 a.m. to 4 p.m.
" 16	.26	"	4.30 p.m. to 3 a.m.	" 23	.42	"	{ 6.15 p.m. the 22d, to 4 a.m.
" 17				" 25	.04	"	9 to 11.45 p.m.
" 18	.31	"	4 to 6.30 a.m.	" 27	1.26	"	4 p.m. to 2 a.m. 28th.
" 22	.11	"	2 to 7.30 a.m.	" 28	.24	"	9 a.m. to 4 p.m.
" 25	.14 .36	"	5 to 8.30 a.m. 12.10 to 2.30 p.m.				
Total .	5.03	...	.....	Total .	7.29	...	.....
Sept. 1	.10	Rain	8.45 to 10 a.m.	Dec. 2	1.04	Rain	1 p.m. to 2.30 a.m.
" 2	.28	"	4.45 to 5.30 p.m.	" 3			
" 4	.49	"	5 a.m. to 6.30 a.m.	" 4	.13	"	{ 7.45 a.m. to 4.45 p.m. 8.15 a.m. to 6 p.m.
" 5				" 9	2.24	Rain	6 p.m. to 8 a.m.
" 6				" 10		"	
" 7	.06	"	8.15 a.m. to 1.15 p.m.	" 11			
" 11	.40	"	6.20 p.m. to 3.40 p.m.	" 15	.27	Snow	{ 3 to 6 a.m. 8.45 a.m. to 8 p.m.
" 12				" 21	1.04	Snow	12.20 to 7.20 p.m.
" 13	1.01 .01	"	2.30 to 5 a.m. Showers in p.m.	" 22		Rain	7.20 p.m. to 2 a.m.
" 26	.18	"	5 to 7.15 p.m.	" 30	.04	Snow	6.20 to 11.45 a.m.
Total .	2.53	...	.....	Total .	4.76	...	.....

Total for year 55.10 inches.

BROOKLINE RESERVOIR.

Beyond a few slight improvements to the grounds and fences around this reservoir, it is in the same condition as at the date of the last report.

The anchor-ice gave us great trouble here, as well as at Chestnut Hill, on Dec. 25th and 26th. A small boiler was erected at short notice on the banks and a jet of steam directed into the water, which aided the breaking up of the masses. Extensive repairs will have to be made to the masonry of the principal gate-house whenever the water can be drawn off.

Very respectfully yours,

DESMOND FITZGERALD,

Superintendent.

LIST OF CITY PROPERTY ON THE WESTERN DIVISION.

1879.

CHESTNUT-HILL RESERVOIR.

Effluent Gate-House.

1 hand-pump, 1 12-ft. ladder, 1 10-ft. ladder, 1 wrench, 100 ft. of hose, 25 ft. lead pipe, pipe and hose, $\frac{1}{2}$ ton coal, 2 shovels, 1 rattan broom, 1 set evaporation apparatus, 4 stop-plank hooks, 1 blow-off wrench, 1 gate wrench, 32 ft. galv. chain, lock, etc., 1 fountain nozzle, 13 stop-planks, 1 step-ladder, 5 pictures, 1 gauge, 1 thermometer, 1 broom, 2 brushes and dust-pan, 4 lanterns, hydraulic apparatus, 1 stove, stove-pipe, poker, and hod, 1 settee, 1 mat.

Terminal Chamber.

1 self-registering gauge, 1 broom, 1 settee, 1 dust-pan and brush, 1 stove, stove-pipe, poker, and hod.

Intermediate Gate-House.

18 stop-planks, 2 hooks, 1 wrench.

Influent Gate-House.

26 long stop-plank for conduit, 14 stop-planks, 4 hooks, 1 extra brass screw.

Office.

1 safe, 3 desks, 6 chairs, 3 stools, 5 pictures, 1 telegraph instrument, 2 sets scales, 1 stove, 3 reflecting lanterns, 20 lanterns, 8 brooms, 1 hook-gauge, 2 inkstands, 4 thermometers, 1 copper pan, 6 tumblers, 1 kettle, stove blacking, 8 pairs rubber boots, 7 rubber coats and caps, 8 gauging floats, 1 drawing-table, 1 sink, pump, wash-basin and 10 towels, 1 automatic rain gauge, 4 balls twine, 1 book-case.

Tool-House.

1 box oil-cups, $\frac{1}{2}$ box glass, 1 copper elbow, $\frac{1}{2}$ bbl. lard, oil and cans, 1 bbl. kerosene oil and cans, 1 gall. sperm oil, $1\frac{1}{2}$ cans glycerine, 12 bird-houses, 3 conduit reflectors, 3 screen-doors, 75 lbs. waste, 1 padlock, $4\frac{1}{2}$ boxes candles, 4 bars soap, $1\frac{1}{2}$ gross matches, 17 paint-brushes, 1 chimney brush, 2 whitewash brushes, $1\frac{1}{2}$ peck measure, 5 bunches tack, 2 rolls wicking, 2 sheets rubber gaskets, $1\frac{1}{2}$ lbs. camphor, 3 ice-chisels and hooks, 1 ice-saw, 2 glass floats, 1 Johnson pump, 12 window-screens, 1 water-tank, 2 rain-gauges, 6 horse-bonnets, 2 sun-umbrellas, 7 draft-chains, 8 striking-hammers, 1 hand-hammer, 8 sledge-hammers, 2 paving-hammers, 5 axes, 4 screen-bars, 17 iron bars, 12 square shovels, 10 snow-shovels, 20 round-pointed shovels, 11 scufflers, 47 picks, 2 grub-axes, 8 pick-handles, 5 bars solder, 15 lbs. block-tin, 12 sledge-handles, 2 trowels, 12 rifles, 1 lot of cord, 1 bunch window-cord, 5 cape-chisels, 4 hoes, 4 one-bushel baskets, 4 border-knives, 2 beadles, 4 paving-rammers, 1 root-puller, 5 manure-forks, 1 limb-cutter, 1 gaff-hook, 1 California pump-belt, 25 ft. wire fence, 2 pulleys, 2 mowing-machines, 22 drills, 1 copper tamping-rod, 2 iron spoons, $\frac{1}{4}$ box whetstones, one wooden pulley, $\frac{1}{2}$ can palm-oil, 1 screen-brush, 2 bags grass-seed, 30 lbs. oakum, 7 dozen hay-caps, 1 rubber tank-hose, 1 box candle-sticks, 1 writing-desk, 1 cross-cut saw, 4 small tin dippers, 8 pails, 5 heavy buckets, 1 tin boiler, 1 hay-knife, 100 ft. fuse, 4 sponges, 2 grates, 5 lbs. powder, 3 spades, 14 points, 3 chisels, 3 grass-hooks, 3 watering-pots, 2 feed-baskets, 1 step-ladder, 75 lbs. lead, 16 rattan brooms, 11 swaths, 10 iron rakes, 10 wooden rakes, 8 hay-forks, 3 hay-ropes.

Old Blacksmith's Shop.

1 observatory and instruments, 2 pieces canvas, 1 pair oars, 1 boat, 1,000 shingles, 1 flume, 1 post-spoon, 1 iron cover, 10 bbls. Portland cement, 2 bbls. American cement, $\frac{1}{4}$

bbbl. black oil, 1 lot crusher-plates, 4 screens, 1 large screen, 12 signs, 1 iron bedstead, 1 bbl. paint, 2 plough-points, 1 manhole grate, $\frac{1}{2}$ cask red paint, 1 house force-pump, 1 lot of chains.

Stable.

7 horses, 2 pigs, 8 horse-blankets, 1 rubber horse-cover, 2 sets double harness, 1 hay-rigging harness, 1 express harness, 2 driving harnesses, 9 halters, 4 cart harnesses, 1 harness-pan, 2 galls. neat's-foot oil, 1 Johnson pump, sleigh-bells, 7 surcingles, 1 stove, 3 stable-sponges, 1 bar soap, 3 curry-brushes and combs, 1 set lead chains, 1 hay-cutter, 1 knee-pad, 225 bushels oats, 8 bushels cracked-corn, 6 bushels shorts, 12 tons hay, 1 kettle, 2 brooms.

Carpenter's Shop.

1 stove, 1 clock, 50 ft. clear white-pine, 100 ft. ash, 400 spruce clapboards, 3 hand-saws, 1 panel-saw, 1 bit-stock and bits, 1 level, 8 planes, 4 augers, 1 pair dividers, 6 chisels, 1 axe, 2 gauges, 45 fence-rails, 4 \times 4, 1 wood-saw, 1 water-tank, 400 lbs. nails, 1 lot of screws, 1 hammer, 1 compass-saw, 12 eye-bolts, 1 fence-wrench, 2 ladles, 3 rubber belts, 2 jack-screws, 75 lbs. green paint, 1 can japan, 2 galls. boiled linseed-oil, 2 galls. raw linseed-oil, 5 brushes, 25 galls. black paint, 4 galls. varnish, 2 grindstones, 1 galv. chain and pulley, 1 belt-stretcher, 1 rotary-pump, 23 stop-planks, 4 tons hard coal, $1\frac{1}{2}$ tons soft coal, 1 Blake pump, 1 portable boiler, 1 feed-pump, 1 portable engine, 1 roll brown paper.

Blacksmith's Shop.

1 forge, 1 anvil, 1 set tools, 1 vice, 1 breast-drill, 3 stock-dies and taps, 1 ratchet and drill, 3 files, 30 lbs. iron, 400 lbs. scrap-iron, 4 pairs pipe-tongs, 1 solid die-plate, 200 ft. steam-pipe, 3 cold-chisels, 3 monkey-wrenches.

Yard.

1 derrick and rigging, 1 Blake stone-crusher, 1 12-horse-power engine, 1 20-horse-power engine, 2 cans, 1 portable building and shed, 60 ft. 4-inch suction-pipe, 1 piece of lead suction-pipe (syphon), 1 piece of copper suction-pipe, 18-inch, 16 ft. of 4-inch suction-pipe, 12 ft. 4-inch iron suction-pipe, 3 clay-knives, 18 fire-buckets, 1 carryall, 1 sleigh, 1 open buggy, 1 covered buggy, 1 express wagon, 1 2-horse wagon, 4

carts, 2 water-carts, 1 hay-wagon, 1 pung, 2 2-horse sleds, 1 2-horse truck, 2 road-rollers, 1 pair large wheels, 2 moving-wheels, 4 roller-wheels, 1 horse-power, 2 hand-carts, 1 spare pole, 2 hand-rollers, 1 fire-engine, 1 whip, 1 buffalo robe, 1 watering-pot, 2 jacks, 2 conduit-forms, 1 step-ladder, 1 30-ft. ladder, 1 28-ft. ladder, 2 12-ft. ladders, 2 bundles straw, 2,000 bricks, 5 tons sand, 1 lot cast-iron grates, 1 lot clay, 1 scraper, 2 snow-ploughs, 1 plough, 1 harrow, 55 granite-bounds, 5 cedar-posts, 1 rain-gauge, 6 ft. Scotch drain-pipe, 42 ft. 15-in. drain-pipe, 9 ft. 30-in. drain-pipe, 6 gravel-screens, 6 wheelbarrows, 125 pickets.

Brookline Reservoir.

1 writing-desk, record-book, ink-rack, etc., 1 gauge, 1 stove, stove-pipe, 32 ft., hod and poker, 1 pitcher, 1 tumbler, 1 spittoon, 1 lantern, 1 stove-brush, 2 settees, 4 stop-plank hooks, 2 towels, 2 mats, 1 pair rubber boots, 1 scythe, 3 shovels, 1 pick, 1 dust-brush, 2 rakes, 1 hoe, 1 sickle, 1 scuffler, 2 water-pails, 1 13-ft. ladder, 1 step-ladder, 1 sponge, 1 pair hedge-shears, 1 dust-pan, 1 feather duster, 1 bushel basket, 1 border knife, 1 wheelbarrow, 1 spade, 1 broom, 1 screen-brush, 1 rattan-broom, 2 scrubbing-brushes, 1 watering-pot, 1 axe, 1 chair, 1 wrench, 1 40-inch gate-key, 9 ft., 2 36-inch gate-keys, 4 ft., 1 30-inch gate-key, 6 ft., 2 air cock wrenches, 2 gate-wheels, 1 gate-cover, 1 gate-crank, 2 gate-chamber wheels, 38 stop-planks, 3 ft., $3\frac{1}{2}$ inches \times 8 inches, 18 stop-planks, 4 ft. 5 inches \times 8 inches, 33 stop-planks, 5 ft. 6 inches \times 8 inches, 3 gas-fixtures, 1 frame for gates, 1 rammer, 4 keys for 48-inch connection, 1 wrench, iron cover and wooden cover for 48-inch connection, 1 crow-bar, 3 thermometers, 5 padlocks, 2 screen-doors, 6 window-screens, 6 screens, $5\frac{1}{2} \times 5$ ft., 1 iron ladder, $7\frac{1}{2}$ ft., 4 signs, 1 hammer, 1 cold chisel.

Lake Cochituate.

2 25-horse-power engines, 3 18-inch pumps, 3 12-inch pumps, shafting-pipe and tools, 4 stop-plank hooks, 2-in. hooks, 1 box bolts and pieces of steam-pipe, 2 pieces boiler-plate, 1 dining-room table, 18 dining-room chairs, 1 small table, 1 mirror, 1 air-tight stove, 1 oil-cloth carpet, 2 spittoons, 2 record-books, 1 old range, 1 bowl and slab, 1 steel-yards, 1 horse, 1 wagon, 1 light wagon, 1 cart, 1 pung, 3 harnesses, 1 buffalo robe, 1 map, 1 rain-gauge, 2 light-stands, 1 old boat (flat bottom), 1 metal boat, 1 telegraph instrument, 3 wheelbarrows, lot of fence-rails, 6 rolls, 38 stop-planks, 1 screen for gate-house, 4 hoes, 1 scythe, 2

pieces rubber-hose, 1 rope, 2 gravel-screens, 1 drain-mould, 1 lot of corrugated iron, 4 rattan-brooms, 6 candlesticks, 2 grindstones, 1 grappling-iron, 1 boat-hook, 1 raft, 2 square-pointed shovels, 2 snow-shovels, 2 round-pointed shovels, 10 picks, 2 grub-hose, 2 stone hand-trucks, 4 ox-chains, 1 short chain, 2 rakes, 2 whitewash brushes, 1 saw, 1 hammer, 1 roll telegraph-wire, 1 sledge, 1 striking-hammer, 1 road-roller, 5 bbls. cement, 1 pair hedge-shears, 2 sickles, 2 hay-forks, 1 manure-fork, 50 stone-bounds, 6 pails, 1 pair oars, 2 sand-sieves, 6 hand-drills, 2 hand-drill hammers, 6 steel points, 3 axes, 1 hatchet, 2 iron settees, 1 keel-bottom boat, 1 set small scales, 2 jointers, 1 pointing-trowel, 4 bars, 1 pinch-bar, lot of scrap-iron, copper and lead, lot of chimneys, etc., 3 pairs rubber boots.

SUDBURY CONDUIT.

Farm Pond Gate-House.

1 stove, stove-pipe, poker, shovel and hod, 1 dust-pan and brush, zinc, 6 ft. \times 5 ft., $1\frac{1}{2}$ tons coal, 1 bag cotton-waste, 1 pail, 1 broom, 1 hammer, 1 wrench, 1 screw-driver, 2 screen-bars, 2 screen-wrenches, 2 handles for gates, 1 brush and rake for cleaning screens, 2 pair rubber boots, 1 shovel, 1 step-ladder, 1 chair, 1 11-ft. ladder, 1 table, 2 gauges, 56 stop-planks, 8 feet 6 inches \times 8 inches \times 4 inches, 1 wood-box, 1 coal-box, 1 closet, 2 stop-plank hooks, 2 lanterns, box of rotten-stone, 5 yds linen, 16 candles, 1 tin pan, stove-black-ing, and brush, 1 oil-cup, 3 cans, 1 qt. kerosene oil, 1 rope.

Course Brook Waste Weir.

12 stop plank, 9 feet 8 inches \times 8 inches \times 4 inches, 4 stop-plank hooks with rope attached, 4 iron rods, 1 10-ft. pole, 1 paint-brush, 2 paint-pots, 2 water-pails, 1 wrench, 1 brush, 1 lb. oakum, 2 shovels, 2 brooms, 1 iron rake, 1 spade, 1 sod-rammer, 9 lbs. grass seed.

Bacon's Brook Waste Weir.

2 wheelbarrows, 12 stop-planks, 9 feet 9 inches \times 8 inches \times 4 inches, lot of old lumber and iron, 2 iron rakes, 2 shovels, 2 sod-rammers, 2 picks, 1 broom, 1 oil-can.

Rosemary Brook Blow-off.

1 gate-wrench.

Fuller's Brook Waste Weir.

12 stop-planks, 9 feet 9 inches \times 8 inches \times 4 inches, 1 pole with hook attached, 1 spade, 1 iron rake, 1 shovel, 1 sod-rammer, 1 pail.

West Syphon Chamber.

52 stop-planks, 6 ft. \times 8 in. \times 4 in., 1 stove, stove-pipe, poker and hod, 1 coal-box, $\frac{1}{4}$ ton coal, 1 gauge, 3 pair rubber-boots, 2 old horse-blankets, 1 stool, 1 gate-hook, 1 hook for bolting door, 1 lantern, 1 can, 1 qt. kerosene, 6 galls. black varnish, 1 can of thinning, 1 padlock, 1 sponge, 3 paint-brushes, 1 scrubbing-brush, 1 jug, 1 stove-brush, 1 hammer, 5 lbs. nails, 6 calking-irons, 3 steel points, 1 floor-brush, 1 broom, 1 axe, one saw, 1 bag cotton-waste and oakum, 1 bushel basket, 1 long handle shovel, 1 square pointed shovel, 1 auger, 3 conduit reflectors, 1 wooden rake, 1 pail, 1 piece of rope, 7 ladders, 1 bag grass-seed, 11 sheets sand-paper.

East Syphon Chamber.

52 stop-planks, 6 ft. \times 8 in. \times 4 in., 1-in. chisel, 1 pick, 2 shovels, 1 lantern, 1 oil-can, 1 steel point, 3 calking-irons, 1 conduit reflector, 19 candles, 1 flat-bottomed boat, 1 gauge, 2 pails, 1 rope, 1 wooden roller, 1 wheelbarrow, 1 sod-rammer, 1 iron rake, 1 spade, 1 horse, 1 express-wagon, 1 harness, 1 collar, 1 halter, 1 weight, 1 feed-basket, 2 blankets, 1 surcingle.

Clarke Waste Weir.

12 stop-planks, 9 ft. 9 in. \times 8 in. \times 4 in., 2 stop-plank hooks, 1 broom, 1 shovel, 1 iron rake, 1 sod-rammer.

Tool-shed, near Fuller's Waste Weir.

15 plank, 14 ft. \times 8 in. \times 3 in., 5,000 hard brick, 4 wheelbarrows, 9 lanterns, 1 jug, 2 tin-cans, 2 conduit reflectors, 1 sieve, 3 Joice ladders, 12 ft. long, 3 pails, 2 horses, pile of old lumber, $1\frac{1}{2}$ casks cement, small quantity of oakum and shingles, 2 scrubbing-brooms.

REPORT OF THE SUPERINTENDENT OF THE MYSTIC WATER WORKS.

CHARLESTOWN DISTRICT, BOSTON, May 1, 1879.

HON. TIMOTHY T. SAWYER, *Chairman Boston Water Board*: —

SIR, — I herewith submit my report for the year ending April 30, 1879, as Superintendent of the Mystic Water Works.

LAKE.

At the lake the shores and riprap have received the usual care and attention. The filling and grading on the westerly side of the dam have been continued. The usual daily records of the levels of the water, the overflow at the dam, and the rainfall, have been sent to the City Engineer. The building which was moved last year and located near the "Waste Weir," has been gradually transformed into a tenement, and will hereafter be occupied by the attendant at the lake.

MYSTIC SEWER.

The Mystic-valley Sewer was turned over to the department under my charge by the Board, November 27, 1878. A large amount of drainage is now carried off by this sewer that formerly found its way into the tributaries of Mystic lake.

CONDUIT.

At the upper gate-house, in October, the screen in the south chamber gave way, by the breaking of the centre bearing, on account of the pressure, caused by an accumulation of leaves and the strong current of the water at this point. The screen being under water and stationary, it was necessary to employ a diver to repair it. In the gate-chamber, at the lower end, an entirely new set of screens has been put in, being made whole instead of in sections, as before, which is a great improvement. In every other respect the conduit and its appurtenances appear to be in good order.

PUMPING STATION.

The pumps have required but ordinary repairs during the year, and are now apparently in good condition. Engine No. 1 was run $216\frac{1}{2}$ days, No. 2, $239\frac{1}{4}$ days, and No. 3, $134\frac{1}{2}$ days. The amount of coal used was 8,141,200 lbs. The amount of clinker produced was 620,665 lbs., or $7\frac{6}{10}$ per cent. In July the feed-pump, which was received with Engine No. 3 when that was set up, but for which we never had any use, was exchanged, by order of the Board, with Mr. Worthington, for one of his 12-inch direct-acting steam pumps, which has been located on the division wall between the two pump wells, to be used whenever any repairs are needed on the suction-pipes, foot-valves, or on the well itself, and is an arrangement that has long been needed; in fact, should have been made when the works were first built, as heretofore we have had to use a steam fire-engine for this purpose. In the boiler-room two of the furnaces to the larger boilers have been rebuilt and furnished with new grate bars, otherwise the boilers have required but the usual or ordinary repairs. The grounds about the engine-house, also the dwelling-houses and stable, are in good condition. A number of trees of different kinds has been received from a surplus on hand at Chestnut Hill, and 100 spruce trees have been purchased and set out this spring about the engine-house grounds, which make a very decided improvement in the appearance of the whole place.

The coal record for the year is as follows:—

On hand May 1, 1878	612 $\frac{232}{1000}$ tons.
Received from May 1, 1878, to May 1, 1879, 3,394 $\frac{87}{1000}$	“
Total	4,006 $\frac{319}{1000}$ “
Used from May 1, 1878, to May 1, 1879	3,700 $\frac{528}{1000}$ “
On hand May 1, 1879	305 $\frac{791}{1000}$ “

FORCE MAINS.

During the year another line of pipe has been laid, under the direction of the City Engineer, from the pumping station to the reservoir.

RESERVOIR.

After the new force main was completed the water was shut off from the reservoir, and pumped directly into the

city through the gate-house, and the water in the reservoir was drawn out, the first time for 12 years.

SUPPLY MAINS.

The supply mains have required no repairs during the year, and are apparently in good condition.

DISTRIBUTING MAINS.

The distributing mains have been extended 794 feet, all with cast-iron pipe, and 4,128 feet of the cement pipes have been replaced with cast-iron, 4,116 feet being enlarged from 8 to 12 inches. Fourteen additional hydrants have been located, viz., 10 Post and 4 Lowry. There were 26 "breaks" on the cement mains during the year in the city.

SERVICE PIPES.

There were 69 new service pipes entered during the year; 9 tin-lined pipes replaced with lead pipes, 8 pipes lowered, 4 enlarged, and 11 changed from U branches to single supplies. 422 boxes have been renewed. There were 45 stoppages by fish, 20 by rust, and 10 by frost.

In Chelsea and Everett there has been no extension of the main pipes, the total length in each place remaining the same as last year, viz., 149,339 feet in Chelsea, 75,772 feet in Everett.

In Somerville the main pipes have been extended 1,762 feet, making the total length 236,405 feet. Ninety-three new service pipes have been entered the past year.

The following tables give the amount of pipe laid and re-laid during the past year, and the amount now connected with the works; also the stock on hand May 1, 1879.

Respectfully submitted,

CHAS. H. BIGELOW,

Superintendent.

Distribution Pipes Relaid in Charlestown in 1878-79.

Streets.	Original Size.	SIZE OF PIPE.					Kind of Pipe.
		4 in.	6 in.	8 in.	10 in.	12 in.	
		Feet.	Feet.	Feet.	Feet.	Feet.	
Medford	10 inch.	...	...	...	...	4,116	Iron.
Lexington	8 "	...	...	...	12	...	"
Everett	4 "	...	24	...	...	...	"
Elm	4 "	...	...	12	...	...	"
Polk	4 "	...	24	...	...	...	"
Pearl	8 "	...	...	...	...	12	"
Cook	4 "	...	36	...	...	...	"
Baldwin	4 "	...	24	...	...	...	"
Belmont	4 "	...	24	...	...	...	"
Quincy	4 "	24	...	...	...	...	"
Webster	4 "	12	...	...	...	...	"
Short	4 "	24	...	...	...	...	"
Bunker Hill	8 "	12	...	432	...	...	"
Park	6 "	36	492	...	...	...	"
Joiner	4 "	...	12	...	...	...	"
Bow	8 "	...	...	52	...	...	"
Union	8 "	...	...	36	...	...	"
So. Eden	4 "	...	12	...	...	...	"
Walker	4 "	...	600	...	...	...	"
High	6 "	...	12	...	...	...	"
Lexington Avenue	2 "	300	...	...	...	...	"
Monument	4 "	24	...	...	...	...	"
Totals . . . . .	.....	432	1,260	532	12	4,128	

Extension of Distribution Pipes in Charlestown in 1878-79.

Streets.	SIZE OF PIPE.					Kind of Pipe.	Total Feet.
	4 inch.	6 inch.	8 inch.	12 inch.	30 inch.		
Cannon	168	.....	.....	.....	.....	Iron.	168
Cook	7	.....	.....	.....	"	7
Belmont	24	.....	.....	.....	"	24
Walnut	7	.....	.....	.....	"	7
Elm	24	.....	.....	.....	"	24
Pearl	12	.....	.....	.....	"	12
Parker	12	.....	.....	.....	"	12
Medford	24	.....	.....	.....	"	24
Engine-house ground	72	444	.....	"	516
New Force Main	3,366	"	3,366
Totals	168	110	72	444	3,366	.....	4,160

Service Pipes Laid in Charlestown in 1878-79.

Size.	$\frac{1}{2}$ inch.	$\frac{5}{8}$ inch.	$\frac{3}{4}$ inch.	1 inch.	$1\frac{1}{2}$ inch.	2 inch.	Total No.	Total Feet.
Number	24	39	3	1	1	1	69	1,584

CHARLESTOWN.	{	Relaid	6,364 feet.
		Relaid and enlarged . . .	5,640 "
		Extension	794 feet.
		Laid previous	153,396 "
		Aggregate	154,190 " or 29 miles, 1,070 feet.
CHELSEA.		Laid previous	149,339 feet, or 28 miles, 1,499 feet.
SOMERVILLE.	{	Extension	1,762 feet.
		Laid previous	234,649 "
		Aggregate	236,405 " or 44 miles, 4,085 feet.
EVERETT.		Laid previous	52,772 feet, or 14 miles, 1,852 feet.
ENGINE HOUSE GROUNDS, SOMER- VILLE.	{	Laid previous	287 feet.

Total amount of distribution pipe May 1, 1879, 116 miles, 2,513 feet.

Summary of Pipes, Gates, and Hydrants connected with the Works, May 1, 1879.

Pipes.	36 inch.	30 inch.	24 inch.	20 inch.	16 inch.	12 inch.	10 inch.	8 inch.	6 inch.	4 inch.	3 inch.	2 inch.
	974	7,354	16,867	200	14,478	5,292	3,989	11,450	15,044	10,505	21,420	666
Iron												
Cement		17,515		3,980	6,950	12,042	20,483	67,633	187,415	291,636	31,190	9,828
Aggregate	<div> <div>756,961 feet, or</div> <div>143 miles and 1,921 feet.</div> </div>											

Gates.	30 inch.	24 inch.	20 inch.	16 inch.	12 inch.	10 inch.	8 inch.	6 inch.	4 inch.	3 inch.	Total.
	11	6	4	20	31	29	105	328	482	65	1,081

Hydrants.	Charlestown.	Chelsea.	Somerville.	Everett.	Medford.	Total.
	164	5	3	1		168
Lowry						
Flush	35	5	24		5	69
Post	28	131	252	67	5	481
	225	136	279	68	10	718

STOCK ON HAND.

Iron Pipe. — 3 lengths 36-inch; 19 lengths 30-inch; 20 lengths 24-inch; 2 lengths 20-inch; 10 lengths 16-inch; 190 lengths 12-inch; 156 lengths 10-inch; 280 lengths 8-inch; 198 lengths 6-inch; 429 lengths 4-inch.

Iron Branches. — 5 16 × 16-inch; 4 16 × 12-inch; 4 16 × 10-inch; 8 16 × 8-inch; 4 16 × 6-inch; 3 16 × 4-inch; 8 12 × 12-inch; 8 12 × 10-inch; 18 12 × 8-inch; 20 12 × 6-inch; 18 12 × 4-inch; 8 10 × 10-inch; 13 10 × 8-inch; 14 10 × 6-inch; 3 10 × 4-inch; 16 8 × 8-inch; 18 8 × 6-inch; 15 8 × 4-inch; 21 6 × 6-inch; 10 6 × 4-inch; 13 4 × 4-inch; 3 12 × 12-crosses; 4 12 × 6-crosses; 2 8 × 6-crosses; 1 4 × 4-cross; 1 30-inch.

Offsets. — 12 4-inch; 11 6-inch; 12 8-inch; 6 12-inch.

Iron Bends. — 33 16-inch; 41 12-inch; 52 10-inch; 52 8-inch; 28 6-inch; 9 4-inch; 15 30-inch circles.

Iron Reducers. — 4 16 to 12-inch; 12 12 to 8-inch; 12 12 to 6-inch; 4 12 to 10-inch; 5 10 to 8-inch; 6 10 to 6-inch; 11 8 to 6-inch; 6 8 to 4-inch; 9 6 to 4-inch.

Iron Sleeves. — 2 36-inch; 6 30-inch; 6 24-inch; 4 20-inch; 12 16-inch; 7 12-inch; 23 10-inch; 10 8-inch; 10 6-inch; 14 4-inch; 64 3-inch.

Iron Plugs. — 10 6-inch; 5 8-inch; 10 4-inch.

Gates. — 1 20-inch; 1 16-inch; 2 10-inch; 2 8-inch; 2 6-inch; 1 4-inch; 20 frames and covers.

Hydrants. — 1 16-inch 3-way Low. hyd. pat.; 1 12 × 12-inch do.; 1 12 × 8-inch do.; 1 12 × 6-inch do.; 1 6 × 6-inch do.; 1 8 × 6-inch do.; 1 4 × 4-inch do.; 2 8 × 6-inch 4-way do.; 2 10 × 8-inch 3-way do.; 4 10 × 4-inch do.; 1 8 × 8-inch; 1 8 × 6-inch; 2 8 × 4-inch; 1 8 × 8-inch; 1 6 × 6-inch; 1 6 × 4-inch; 1 4 × 4-inch 4-way; 1 4 × 4-inch 3-way; 10 Low. hydrant bbls. and valves; 7 frames and covers; 10 frames, 9 covers; 2 4-inch post hydrants; 1 flush do.; 2 garden do.; 7 blanks; 30 lbs. gasket; 2 lbs. rub. valve; 12 $\frac{5}{8}$ -inch post hyd. stops.

Cement Pipe. — 2 30-inch; 4 20-inch; 4 16-inch; 14 8-inch; 34 6-inch; 10 4-inch; 3 2-inch.

SERVICE DEPARTMENT.

63 lbs. 2-inch lead pipe; 816 lbs. 1-inch do.; 957 lbs. $\frac{3}{4}$ -inch do.; 1,776 lbs. $\frac{5}{8}$ -inch; 322 lbs. $\frac{1}{2}$ -inch do.; 22 $\frac{1}{2}$ -inch corporation-stop; 12 $\frac{5}{8}$ -inch do.; 70 $\frac{5}{8}$ -inch 3-way do.; 12 $\frac{3}{4}$ -inch do.; 10 1-inch do.; 1 2-inch stop; 12 $\frac{1}{2}$ -inch stop; 25 $\frac{5}{8}$ -inch do.; 10 $\frac{3}{4}$ -inch do.; 31 1-inch do.; 10 $\frac{5}{8}$ -inch hose bibbs; 130 lbs. solder; 40 lbs. tin; 8 papers rivets; 6 2-

inch sol. nipples; 13 1-inch do.; 4 $\frac{3}{4}$ -inch do.; 8 $\frac{1}{2}$ -inch do.; 27 wood service boxes; 17 iron do.; 136 service box covers; 200 bricks.

METERS.

1 4-inch Worthington meter; 1 3-inch do.; 2 2-inch do.; 3 1-inch do.; 3 $\frac{3}{4}$ -inch do.; 3 $\frac{5}{8}$ -inch do.; 1 $1\frac{1}{4}$ -inch Ball and Fitts do.; 1 1-inch do.; 1 $\frac{3}{4}$ -inch do.; 1 1-inch rotary; 1 frame and 7 covers; 22 $\frac{5}{8}$ -inch connections; 24 1-inch do.; 8 2-inch do.; 6 4-inch indexes; 6 2-inch do.; 4 1-inch do.; 10 $\frac{5}{8}$ -inch do.; 5 meter boxes; 6 lbs. brass wire.

SUNDRIES.

5,396 feet board; 1,326 feet plank; 1 bdl. sheet-iron; 1 bdl. gal. iron; 1 bbl. calcine plaster; 8 kegs 40d. nails; 9 kegs 30d. do.; 3 kegs 20d. do.; 3 kegs 10d. do.; 1 keg 8d. FF do.; 1 keg 6d. FF do.

PAINTS AND OILS.

1 bbl. boiled linseed-oil; 1 bbl. raw do.; 1 keg white lead; 18 lbs. dry Brandon; 20 lbs. dry English red; 1 box 9×13 window-glass; 3 boxes 8×10 do.; $\frac{1}{2}$ box 18×12 do.

TOOLS, ETC.

3 Low. hyd. chucks; 150 feet 2-inch canvas hose; 150 feet $\frac{3}{4}$ -inch rub. do.; 12 street-lanterns; 24 hand do.; 16 Trench pumps; 10 street-horses; 3 bench-vises; 1 pipe do.; 1 bench shears; 2 hand do.; 2 ratchet drills; 2 braces and 1 set bitts; 1 set taps and drills for iron pipe; 1 machine for tapping iron pipe; 1 set drills for cement pipe; 5 sledges; 6 ladles; 9 monkey wrenches; 1 hatchet; 2 axes; 8 carpenter's planes; 20 calking hammers; 7 cutting chisels; 6 trowels; 7 hand-saws; 1 compass do.; 2 augers; 8 jamming irons; 50 sets; 8 paving hammers; 1 square; 3 plumber's furnaces; 6 plumber's pots; 8 cold chisels; 6 carpenter's do.; 1 rivet set; 1 copper pump; 1 iron force do.; 6 diamond points; 2 dividers; 25 feet $\frac{1}{4}$ -inch tin tube; 1 belt punch; 12 screw-drivers; 1 chain tongs; 7 frost wedges; 3 cutting knives; 12 pairs rub. mitts; 2 palette knives; 3 pipe cutters; 12 pipe-tongs; 1 die and plate; 20 working wrenches; 11 service wrenches; 9 gate wrenches; 2 valve do.; 3 drilling crabs; 2 chain slings; 1 Low. hyd. do.; 178 S.H. R.P. shovels; 29 S.H. S.P. do.; 38 L.H. R.P.

do.; 120 picks; 20 rammers; 3 lead furnaces with pots; 4 derricks; 7 blocks and falls; 2 iron grapples; 2 long tongs; 1 copper hose pipe; 1 copper 3-way hose connections; 2 bench screws; 2 hoes; 12 flat 14-inch files; 13 flat 12-inch files; 18 assorted saw files; 1 tar kettle; 1 windlass derrick; 1 grindstone; 19 paint-brushes.

FIXTURES.

2 150 gall. tanks, 2 spring-water gauges, 1 mercury do., 200 ft. lead pipe, 1 platform scales, 2 work-benches, 2 iron sinks, 2 stoves, 2 desks, 3 office chairs, 1 stool, gas fixtures, 2 chest of drawers, 1 clock.

STABLE DEPARTMENT.

500 lbs. hay, 500 lbs. salt hay, 6 horses, 4 harnesses, 2 cart do., 6 blankets, 5 buffalo robes, 2 oil covers, 1 sleigh, 3 pungs, 2 buggies, 3 wagons, 2 stable forks, 2 hay do., 5 currycombs, 3 brushes, 1 wheel-jack, 2 pails, 2 axes, 1 lantern, 1 stove and kettle, 3 carts, 1 hay wagon, 1 plough and 1 harrow, 2 harnesses for do., 2 grain chests, 2 bales straw, 1 hay-cutter, 2 bags oats, 1 do. corn.

ENGINE-HOUSE DEPARTMENT.

7 picks, 17 L. H. shovels, 19 S. H. do., 3 spades, 5 iron bars, 2 log-hooks, 1 ladder, 1 lawn-mower, 1 border-cutter, 1 corn hook, 1 hedge shears, 1 Edson pump, 1 rammer, 1 stone drag, 1 scraper, 1 claw hammer, 1 calking hammer, 3 striking do., 2 stone do., 2 levels, 2 hoes, 7 mortar do., 1 grub do., 3 axes, 1 trowel, 1 monkey wrench, 1 hydrant do., 6 drills, 1 square, 1 screw-driver, 3 points, 3 scythes, 6 rakes, 6 pails, 4 lanterns, 4 nets, 3 cask nails, 1 brace and 4 bitts, 50 feet rubber hose, 1 iron roller, 1 platform scale.

RESERVOIR.

3 sets block and falls, 1 clock, 1 table, 1 chisel, 1 pick, 1 shovel, 1 wheelbarrow, 1 hydrant wrench, 1 hammer, 1 axe, 1 stove, 1 force pump, 4 pails, 2 lanterns, 2 hand-lamps, 1 bbl. kerosene oil.

CONDUIT.

2 sets block and falls, 1 stove, 1 net, 4 screen hooks, 1 stove, 1 clock, 1 table, 3 chairs, 1 rake, 3 nets, 1 grindstone, 1 hammer, 1 wood-saw, 1 tool-chest, 1 axe, 4 starting ham-

mers, 1 boat, 2 boat-hooks, 2 oars, 4 round covers and frames for sewer.

PUMPING SERVICE.

Stock on Hand. — 1 bbl. kerosene oil, 1 do. sperm oil, 30 gall. cylinder oil, 1 gall. polishing oil, 4 gall. boiled oil, 1 bar castile soap, 1 gro. matches, 23 bars hard soap, 20 gall. soft soap, 40 lbs. rubber-cloth packing, 14 lbs. hemp, $7\frac{1}{2}$ lbs. Seldon's, $6\frac{1}{2}$ lbs. Martin's, 10 boiler hand-hole packings, 10 do. man-hole do., $2\frac{3}{4}$ lbs. asbestos, 25 lbs. red lead, 10 lbs. white lead, 2 valve seats, 1 set springs, 8 feet 6-inch copper pipe, 100 feet $\frac{3}{4}$ -inch round iron, 30 feet $1\frac{1}{4}$ -inch do., 2 6-inch globe valves, 1 6-inch T do., 139 lamp chimneys, 12 Argand lamp-burners, 105 yards lamp-wick, 25 lbs. 1-inch brass pipe, 7 lbs. $\frac{3}{4}$ -inch do., 21 lbs. $\frac{1}{2}$ -inch do., 11 feet $1\frac{1}{4}$ -inch iron pipe, 6 feet 1-inch do., 14 feet $\frac{1}{2}$ -inch do., 2 $1\frac{1}{2}$ -inch valves, 2 1-inch do., 10 $\frac{3}{4}$ -inch brass elbows, 20 do. iron, 5 $\frac{1}{4}$ -inch plugs, 2 $\frac{1}{4}$ -inch elbows, 6 $\frac{1}{4}$ -inch nipples, 9 $\frac{3}{8}$ -inch couplings, 5 $\frac{3}{8}$ -inch elbows, 5 $\frac{3}{8}$ -inch nipples, 7 $\frac{1}{2}$ -inch couplings, 5 $\frac{1}{2}$ -inch plugs, 6 $\frac{1}{2}$ -inch elbows, 3 $\frac{1}{2}$ -inch nipples, 4 $\frac{3}{4}$ -inch unions, 20 $\frac{3}{4}$ -inch couplings, 9 $\frac{3}{4}$ -inch T's, 21 $\frac{3}{4}$ -inch nipples, 2 1-inch unions, 23 1-inch couplings, 10 $\frac{1}{4}$ -inch plugs, 6 1-inch T's, 4 1-inch elbows, 4 1-inch nipples, 9 $1\frac{1}{2}$ -inch couplings, 3 $1\frac{1}{2}$ -inch plugs, 6 $1\frac{1}{2}$ -inch T's, 13 $1\frac{1}{2}$ -inch elbows, 10 $1\frac{1}{2}$ -inch nipples, 3 2-inch unions, 5 2-inch couplings, 3 2-inch T's, 5 2-inch nipples, 22 $\frac{3}{8}$ -inch bolts, 27 stud bolts, 38 $\frac{5}{8}$ -inch bolts, 12 piston do., $5\frac{1}{2}$ lbs iron washers, 160 fire-brick.

Tools and Fixtures. — 2 tables, 4 chairs, 1 clock, 1 desk, 2 scales, 1 24-inch standard gauge, 2 ladders, 16 kerosene lamps, 3 hand-lamps, 2 pails, 2 water-pots, 2 gall. oil cans, 1 duster, 1 wheelbarrow, 1 steam kettle, 1 brace and bitts, 2 sledges, 5 screw-drivers, 4 screw-wrenches, 2 Stillson' do., 8 S do., 27 socket do., 8 box do., 9 service do., 1 anvil, 1 forge, 2 vises, 2 bars, 12 cold-chisels, 2 sets fire-irons, 3 shovels, 2 coal cars, 2 jack-screws, 2 ratchets, 2 sets taps and dies, 1 set pipe tongs, 2 pipe-cutters, 2 blocks and falls, 2 valve-seat reamers, 25 draw-bolts, 10 eye-bolts, 150 feet $2\frac{1}{2}$ -inch hose, 100 feet $\frac{3}{4}$ -inch do., 4 oil cans, 1 waste can, 1 tallow press, 17 12-inch files, 3 brooms, 100 lbs. cotton waste, 75 lbs. mop do., 2 feather dusters, 3 hair do., 3 mats, 1 brass lantern, 3 derricks.

REPORT OF THE SUPERINTENDENT OF THE EASTERN DIVISION.

Boston, May 1, 1879.

HON. T. T. SAWYER, *Chairman Boston Water Board*:—

SIR,—My report for the year ending with April 30 is respectfully submitted.

The general condition of the works at the present date is good. Beyond the laying of about $8\frac{1}{3}$ miles of main pipes of the small sizes, and the general maintenance of the works, nothing of particular note has been done during this year.

MAIN PIPES.

The whole number of feet of main pipe, of all sizes, laid during the year is . . . 40,815 feet.
Relaid 3,300 “

44,115, equal to $8\frac{1875}{5280}$ miles.

SERVICE PIPES.

Whole number put in	796
Length in feet	22,943
Pipes changed	245
“ “ length in feet	2,938

POSTS FOR WATERING-CARTS.

Established during the year	12
Total number now established	18

Location.

Tremont and Hammond park.
Clay, corner Tremont.
Eliot square.
Brookline avenue, corner Longwood avenue.
St. James street, corner Warren.
Blue-Hill avenue, between Waverley and Clifford streets.
Warren street, corner Gaston.

Egleston square, corner Walnut avenue.
 Dale, corner Walnut avenue.
 Dudley street, opposite Howard avenue.
 Upham's corner.
 Field's corner and Dorchester avenue.
 Dorchester avenue and Savin-Hill avenue.
 " " at Old Boston line.
 Beach street, at Parker, Harrison square.
 Union square, Brighton.
 Washington, corner Winship, Brighton.
 Chestnut-Hill avenue, corner South.

Established fire-pipes	2
" elevators	20

Of the relaying of enlarged sizes, the following table shows the changes in sizes :—

Street.	Between what Streets.	Size now.	No. of feet.	Size form'y
<i>Boston.</i>				
Cooper	Charlestown and Endicott . . .	8 in.	248	6 in.
Sargent's Wharf . .	Commercial st. and end of wharf	6 "	366	4 "
Thatcher avenue . .	Cooper and Thatcher	6 "	169	4 "

MAIN PIPE RELAID.

Commercial st., Clinton and Fleet.....	12-inch.	1,410 feet.
Beacon " Beaver " Brimmer	12 "	218 "
Commercial " Clinton " Fleet.....	6 "	48 "
Parker " Chester park and B. & A. R.R.....	6 "	250 "
G " Fourth and Thomas	6 "	223 "
Cabot " Tremont and Ruggles.....	4 "	1,151 "

RAISED.

Albany st., East Chester park and Springfield.....	12-inch.	212 feet.
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LOWERED.

Adams st., King and Sheldon	12-inch.	50 feet.
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TAKEN UP.

12-inch iron pipe	1,649 feet
9 " " ".....	10 "
6 " " ".....	945 "
1½ " " ".....	1,822 "
1 " lead ".....	46 "
¾ " " ".....	15 "
¾ " " ".....	249 "
½ " " ".....	58 "

**Statement of Location, Size, and Number of Feet of Pipe
laid in 1878.**

In what Street.	Between what Streets.	Diam. of Iron Pipe in In.	Feet of Pipe.
BOSTON.			
Berkeley	Cortes and Chandler	12	314
Newbury	Hereford and Chester Park.....	"	108
	Total 12-inch		422
Reed	Northampton and Reed	6	84
Marlboro	Hereford and Chester Park.....	"	423
Hereford	Commonwealth ave. and Boylston	"	397
Randolph	Harrison ave. and Albany	"	96
Fairfield	Commonwealth ave. and Boylston	"	439
Shaving	Federal and Mt. Washington ave.	"	89
	Total 6-inch.....		1,528
Plympton court.....	Sawyer and Lenox.....	4	45
Chessman place.....	From No. 252 Hanover	"	102
Bumstead court.....	From Boylston.....	"	100
Lincoln wharf.....	From Commercial		38
	Total 4-inch.....		285
SOUTH BOSTON.			
First	A and B.....	6	48
Sixth	P and Q	"	527
M.....	Seventh and Eighth.....	"	336
Bowen	C and D.....	"	136
	Total 6-inch.....		1,047
Place	From No. 732 Eighth.....	4	145
Grimes	Seventh and Eighth	"	142
	Total 4-inch.....		287

Statement of Location, Size, etc. — Continued.

In what Street.	Between what Streets.	Diam. of Iron Pipe in In.	Feet of Pipe.
EAST BOSTON.			
Swift	Saratoga and Bennington.....	12	180
	Total 12-inch		180
Shelby	Princeton and Saratoga	6	122
	Total 6-inch.....		122
Cheever court.....	From Sumner	4	150
	Total 4-inch.....		150
BOSTON HIGHLANDS			
Seaver	Maple and Walnut ave.	12	247
Parker	Prentiss and Ward.....	"	141
	Total 12-inch		388
Day	Perkins and Crelghton	8	872
Atwood ave.	From Day	"	230
	Total 8-inch.....		1,102
Cary	Riverside and Tremont place	6	293
Riverside	Tremont and Cary	"	15
Cabot.....	Tremont and Windsor	"	130
Quincy	Tupelo and Blue Hill ave.	"	17
Wyoming.....	From Warren	"	75
Seaver	Maple and Walnut ave.	"	9
Randolph place	From Rand	"	134
Murray ave.....	From Blue Hill ave.	"	225
Day	Atwood ave. and Perkins.....	"	8
Faxon	Tremont and Smith	"	55
Greenville	Winthrop and Moreland	"	356
Bromley	Heath and Bromley park.....	"	84
Fairland	Winthrop and Mt. Pleasant ave.	"	362
	<i>Amount carried forward</i>		1,763

Statement of Location, Size, etc. — Continued.

In what Street.	Between what Streets.	Diam. of Iron Pipe in In.	Feet of Pipe.
	<i>Amount brought forward</i>		1,763
	BOSTON HIGHLANDS.— Continued.		
Mills	Dale and Rockland.....	6	315
Parker	Prentiss and Ward.....	"	6
Bartlett.....	Lambert ave. and Dudley	"	374
Dudley	Bartlett and Centre	"	441
	Total 6-inch.....		2,899
Perkins place	From Roxbury.....	4	158
	Total 4-inch.....		158
	DORCHESTER.		
Washington	Bailey and Armandine	12	473
Cottage	Pleasant and Sumner	"	287
Blue Hill ave.	River and Norfolk	"	143
River	Mr. Conness' house and Blue Hill ave.	"	3,240
Pond	Pleasant and Dorchester	"	347
Lawrence ave.	Cedar and Blue Hill ave.	"	68
Milton "	Fuller and Bailey.....	"	50
Adam	King and Shelton.....	"	14
	Total 12-inch		4,622
Quincy	R.R. Bridge and Columbia	8	307
"	Howard and Cedar.....	"	266
Bailey	Washington and Dorchester ave.....	"	337
Trull	Hancock and Bellevue	"	903
Fremont	Norfolk and River	"	774
Norfolk	Blue Hill ave. and R.R. Bridge.....	"	1,927
Everett ave.....	Hancock and Stoughton	"	704
	Total 8-inch.....		5,218
Sargent.....	Hartford and Howard ave.	6	101
Quincy.....	Columbia and R.R. Bridge.....	"	8
	<i>Amount carried forward</i>		109

Statement of Location, Size, etc. — Continued.

In what Street.	Between what Streets.	Diam. of Iron Pipe in Inches.	Feet of Pipe.
	<i>Amount brought forward</i>		109
	DORCHESTER. — Continued.		
Fuller	Washington and Dorchester ave.	6	589
Washington	Bailey and Homer	"	12
Trull	Hancock and Bellevue	"	16
Clay	From Neponset ave.	"	19
Street	From Tileston place and Clay	"	54
Orchard	From Boston	"	443
Glen	Glendale and Trull	"	399
Linden	Adam and Dorchester ave.	"	497
Evans	Thetford ave. and Stanton ave.	"	195
Wilder ave.	From Washington	"	264
River	Mr. Conness' house and Fremont	"	17
Fremont	Norfolk and River	"	5
Norfolk	Blue Hill ave. and R.R. Bridge	"	32
Payson ave.	Glendale and Hancock	"	325
Rocky Hill ave.	From Hancock	"	157
Everett ave.	Stoughton and Hancock	"	44
Mill	Adam and Neponset ave.	"	144
Greenwich	Dorchester ave. and Commercial	"	46
Nelson	Norfolk and Evans	"	26
Adam	King and Sheldon	"	35
Willow court	From Boston	"	1,555
Cedar	Quincy and Lawrence ave.	"	632
Humphrey square	From Dudley	"	229
Ware	From Trull	"	237
	Total 6-inch		6,081
Berkeley court	From Berkeley	4	129
	Total 4-inch		129
	WEST ROXBURY.		
LaGrange	Centre and Jordan	12	93
	<i>Amount carried forward</i>		93

Statement of Location, Size, etc. — Continued.

In what Street.	Between what Streets.	Diam. of Iron Pipe in inches.	Feet of Pipe.
	<i>Amount brought forward.....</i>		93
	WEST ROXBURY. — Continued.		
Walnut	School and Williams	12	353
Pond	Prince and Rockwood	"	1,011
	Total 12-inch.....		1,457
Boylston	Burr and A	8	221
Jordan	LaGrange and Dent	"	255
Dent	Jordan and Ivory.....	"	283
Ivory	Dent and Temple.....	"	592
Temple	Ivory and Mr. Temple's house	"	661
Mt. Vernon	Pleasant and LaGrange	"	147
Walker	South and Elm.....	"	307
Boylston	Chestnut and C.....	"	53
Jamaica	South and White ave.	"	166
	Total 8-inch.....		2,685
Burr	Sprink Park and Boylston	6	21
A.....	Spring Park and Boylston	"	122
Maple.....	Cross and Weld	"	376
Erie place.....	From School.....	"	224
School-st. place	From School	"	205
E.....	Spring Park and Rock view	"	161
Bartlett	From Green	"	231
Cypress.....	Baker and Spring.....	"	413
Elm	Everett and Revere.....	"	242
Rockview.....	Spring Park and E	"	271
Ivory	Dent and Temple.....	"	7
Temple	Ivory and Mr. Temple's house	"	14
Perham	Ivory and Winslow.....	"	344
Dent	Ivory and Winslow.....	"	249
Walker	South and Elm.....	"	8
Poplar	South and Washington	"	102
	<i>Amount carried forward.....</i>		2,990

Statement of Location, Size, etc. — Continued.

In what Street.	Between what Streets.	Diam. of Iron Pipe in Inches.	Feet of Pipe.
	<i>Amount brought forward</i> .....	.....	2,990
	WEST ROXBURY. — Continued.		
Montgomery	From Spring.....	6	213
Pond	Prince and Rockwood	"	30
Jamaica.....	South and White ave.	"	1,676
	Total 6-inch.....	.....	4,909
Court.....	From Boylston.....	4	106
	Total 4-inch.....	.....	106
	BRIGHTON.		
Central Hill ave.....	The Ledge and South.....	16	7
	Total 16-inch .....	.....	7
Chestnut Hill ave.....	The Ledge and South.....	12	1,397
South	Chestnut Hill ave. and Foster.....	"	491
Everett	Lincoln and North Beacon	"	364
Nonantum	From Washington	"	311
	Total 12-inch .....	.....	2,563
Murdock	Sparhawk and Whitney	8	79
The Abattoir	From Market.....	"	1,057
Chester.....	Gardner and Ashford	"	92
	Total 8-inch.....	.....	1,228
Highland ave.	From Cambridge.....	6	347
Farrington ave	Harvard ave. and Linden	"	308
Chestnut Hill ave.....	The Ledge and South.....	"	18
Everett place	From Mt. Vernon	"	151
South	Chestnut Hill ave. and Foster.....	"	9
Winship place.....	From Washington	"	829
The Abattoir	From Market.....	"	4
Ashford	Chester and Linden.....	"	224
	<i>Amount carried forward</i> .....	.....	1,890

Statement of Location, Size, etc. — Continued.

In what Street.	Between what Streets.	Diam. of Iron Pipe in Inches.	Feet of Pipe.
	<i>Amount brought forward.....</i>		1,890
	BRIGHTON. — Continued.		
Washburn	From Harvard ave.....	6	284
Everett	North Beacon and R.R. Crossing.....	"	6
Griggs	From Allston	"	222
Peaceable	Winship and Rockland.....	"	161
Court.....	From Washington	"	212
	Total 6-inch.....		2,775
	CHESTNUT-HILL RESERVOIR.		
New Chamber.....	Bradlee Basin	60	260
	Total 60-inch		260
New Chamber.....	Bradlee Basin	48	207
	Total 48-inch		207

RECAPITULATION.

SECTION.	1878-79.	DIAMETER OF PIPES IN INCHES.							Totals.
		60	48	20	10	12	8	6	
Boston	Total number of feet laid . . . . .	.....	.....	.....	.....	422	.....	1,528	285
	Stopcocks in same . . . . .	.....	.....	1	.....	5	1	19	3
South Boston	Total number of feet laid . . . . .	.....	.....	.....	.....	.....	.....	1,047	287
	Stopcocks in same . . . . .	.....	.....	.....	.....	.....	.....	5	2
East Boston	Total number of feet laid . . . . .	.....	.....	.....	.....	180	.....	122	150
	Stopcocks in same . . . . .	.....	.....	.....	.....	.....	.....	1	4
Boston Highlands	Total number of feet laid . . . . .	.....	.....	.....	.....	388	1,102	2,899	158
	Stopcocks in same . . . . .	.....	.....	1	.....	2	2	9	1
Dorchester	Total number of feet laid . . . . .	.....	.....	.....	.....	4,622	5,218	6,081	129
	Stopcocks in same . . . . .	.....	.....	.....	.....	3	9	13	1
West Roxbury	Total number of feet laid . . . . .	.....	.....	.....	.....	1,457	2,685	4,909	106
	Stopcocks in same . . . . .	.....	.....	.....	.....	1	6	14	.....
Brighton	Total number of feet laid . . . . .	.....	.....	.....	7	2,563	1,228	2,775	.....
	Stopcocks in same . . . . .	.....	.....	.....	.....	4	2	8	.....
Chestnut-Hill Reservoir	Total number of feet laid	260	207	.....	.....	.....	.....	.....	.....
	Sums of Pipes	260	207	.....	7	9,632	10,233	19,361	1,115
	Sums of Stopcocks . . . . .	.....	.....	1	.....	15	20	69	116

Statement of the Length of different sizes of Pipes laid, and the number of Stopcocks put in, to May 1, 1879.

DIAMETER OF PIPES IN INCHES.															Aggregate.	
	60	48	40	36	30	24	20	16	12	10	9	8	6	4	3	
Feet of Pipe laid in Brookline, Boston { Highlands, and Boston Proper . . . }	7,283	23,166	20,070	26,770	5,773	5,823	20,069	115,730	36,715	9,923	218	23,074	86,057	6,244	94,605	..
Number of Stopcocks in same . . .	6	6	8	11	11	9	45	249	45	3	..	104	864	414	..	..
Feet of Pipe laid in Boston Highlands .	..	..	185	109	11,427	6,200	12,130	85,346	101,948	..	916	7,167	160,814	29,105	238	..
Number of Stopcocks in same . . .	..	..	1	2	9	4	21	128	120	..	..	15	349	128	2	..
Feet of Pipe laid in South Boston . . .	..	..	..	..	..	13,206	..	47,468	64	..	105	5,156	127,529	37,170	..	..
Number of Stopcocks in same . . .	..	..	..	..	..	6	..	76	9	..	..	9	243	111	..	..
Feet of Pipe laid in East Boston . . .	..	..	..	..	1,463	15,972	2,152	36,715	36,715	9,923	218	23,074	86,057	6,244	..	..
Number of Stopcocks in same . . .	..	..	..	..	8	8	5	45	45	3	..	15	153	55	..	..
Feet of Pipe laid in Dorchester . . .	..	..	..	..	7,784	3,698	456	101,948	101,948	..	1,340	23,358	111,999	4,331	..	..
Number of Stopcocks in same . . .	..	..	..	..	5	2	1	120	120	..	..	35	220	26	..	..
Feet of Pipe laid in West Roxbury . .	..	..	..	..	..	10	2,916	66,413	66,413	..	..	34,552	43,230	1,337	..	..
Number of Stopcocks in same . . .	..	..	..	..	..	..	1	64	64	..	..	41	88	14	..	..
Feet of Pipe laid in Brighton . . .	..	..	..	..	..	..	8,975	42,395	42,395	..	..	21,772	21,636	220	..	..
Number of Stopcocks in same . . .	..	..	..	..	..	..	..	5	57	..	..	31	51	3	..	..
Feet of Pipe laid in Newton, Needham and C. H. Reservoir	7,527	1,435	1,111	2,140	..	..	..	20	2,043	..	..	..	360	..	..	..
Number of Stopcocks in same . . .	..	..	2	..	..	..	..	2	4	..	..	..	2	..	..	..
Totals — Length of Pipe laid	266	14,810	24,601	21,366	29,019	26,447	44,909	46,718	498,058	9,923	3,234	148,959	873,294	173,012	238	1,914,854 ft. equal to 362 miles 3,494 ft.
Number of Stopcocks put in . . . .	..	6	6	11	13	25	29	80	743	3	..	250	1,970	751	2	3,889

Statement of Service Pipe laid in 1878.

DIAMETER IN INCHES.	BOSTON.		SOUTH BOSTON.		EAST BOSTON.		BOSTON HIGHLANDS.		DORCHESTER.		WEST ROXBURY.		BRIGHTON.		TOTALS.		
	Number of Pipe.	Length in Feet.	Number of Pipe.	Length in Feet.	Number of Pipe.	Length in Feet.	Number of Pipe.	Length in Feet.	Number of Pipe.	Length in Feet.	Number of Pipe.	Length in Feet.	Number of Pipe.	Length in Feet.	Number of Pipe.	Length in Feet.	
1 $\frac{1}{4}$	2	92	..	..	..	..	..	..	..	..	..	..	..	..	2	92
1	6	144	2	38	2	32	..	..	2	131	2	60	2	107	16	512
3 $\frac{1}{4}$	2	59	..	..	1	58	1	40	1	19	..	..	..	..	5	176
5 $\frac{3}{8}$	119	3,933	43	1,239	20	546	124	3,324	238	6,575	149	3,834	80	2,712	773	22,163	
Aggregate																796	22,943
Making total number up to May 1, 1879																44,317	

Repairs of Pipes during the Year 1878.

WHERE.	Diameter of Pipes in Inches.																		
	40	36	30	20	16	12	9	8	6	4	3	2	1½	1¼	1	¾	⅝	½	Total.
Boston	2	3	5	.	3	23	2	4	59	52	8	10	113	3	24	9	473	28	821
South Boston . .	.	.	.	6	.	4	.	.	8	4	1	9	.	.	9	1	103	9	154
East Boston . . .	.	.	.	6	.	2	.	3	5	1	.	1	.	.	4	2	76	5	105
Boston Highlands	.	.	1	.	.	.	.	.	5	3	.	.	1	.	1	.	94	6	111
Dorchester . . .	.	.	.	.	.	2	.	2	3	4	.	.	.	.	.	.	11	2	24
West Roxbury . .	.	.	.	.	.	1	.	3	.	.	.	.	.	.	.	.	14	1	19
Brighton . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	3
	2	3	6	12	3	32	2	12	80	64	9	20	114	3	38	12	774	51	1237

Of the leaks that have occurred on pipes of 4 inches and upwards: joints, 137; settling of earth, 17; defective pipe, 10; defective packing, 20; defective gate, 3; cap blown off, 2; struck by pick, 1; burst by frost, 1. Total 191

Stoppage by fish, 17; frost outside, 4; frost inside, 1 22

Of 3-inch and on service pipes: joints, 17; settling of earth, 166; settling of planking, 1; defective pipe, 69; defective faucet, 3; defective coupling, 22; defective packing, 20; coupling loose at main, 2; faucet loose at main, 2; faucet blown out, 1; stiff connections, 112; struck by pick, 61; pipes not in use, 3; gnawed by rats, 15; by roots of a tree, 1; cover falling upon pipe, 1; stone falling upon pipe, 2; burst by frost, 4. Total 502

Stoppage by fish, 280; rust, 202; dirt, 1; gasket, 1; frost outside, 21; frost inside, 17, 522

Total 1,237

Statement of Number of Leaks and Stoppages, 1850-1878.

Year.	DIAMETER OF.		Totals.
	Four inches and upwards.	Less than four inches.	
1850	32	72	104
1851	64	173	237
1852	82	241	323
1853	85	260	345
1854	74	280	354
1855	75	219	294
1856	75	232	307
1857	85	278	363
1858	77	324	401
1859	82	449	531
1860	134	458	592
1861	109	399	508
1862	117	373	490
1863	97	397	494
1864	95	394	489
1865	111	496	607
1866	139	536	675
1867	122	487	609
1868	82	449	531
1869	82	407	489
1870	157	769	926
1871	185	1,380	1,565
1872	188	1,459	1,647
1873	153	1,076	1,229
1874	434	2,120	2,554
1875	203	725	928
1876	214	734	948
1877	109	801	910
1878	213	1,024	1,237

HYDRANTS.

During the year 117 hydrants have been established, and 30 abandoned, as follows :—

	Established.			Post.	Abandoned.			Dif.
	Lowry.	Boston.	Y.		Lowry.	Boston.		
Boston,	13	4	5	1	23	1	15	7
South Boston,	1	2	4		7		2	5
East Boston,	0	1	1		2			2
Boston Highlands,	1	5	1	4	11	1	1	9
Dorchester,	5	12	7	13	37	2	6	29
West Roxbury,	1	10	4	8	23			23
Brighton,	1	3	0	10	14		1	13
Charlestown,							1	1
	<u>22</u>	<u>37</u>	<u>22</u>	<u>36</u>	<u>117</u>	<u>4</u>	<u>26</u>	<u>87</u>

Total amount up to May 1, 1879.

Boston	1,319
South Boston	481
East Boston	293
Boston Highlands	778
Dorchester	659
West Roxbury	301
Brighton	202
Deer Island	16
Brookline	8
Charlestown	10
Chelsea	8
	<u>4,075</u>

25 hydrants have been taken out and replaced by new or repaired ones, and 87 boxes have been taken out and replaced by new ones. The hydrants have had the usual attention paid them.

STOPCOCKS.

116 new stopcocks have been established this year. 54 boxes have been taken out and replaced by new ones. All the stopcocks have had the proper attention paid them.

Statement of Pipes and other Stock on hand, exclusive of Tools, May 1, 1879.

	DIAMETER IN INCHES.														
	60	48	40	36	30	24	20	16	12	10	9	8	6	4	3
Pipes	2	19	32	34	41	32	53	93	1,773	48	6	822	1,021	345	144
Blow-off Branches					3		1		1						
Y Branches					1	1	1	1							
4-Way Branches			2	1	2	8	5	14	57			19	6		
3-Way Branches		2	9	6	4	9	2	23	32	5		64	78	25	
Flange Pipe			1	1		1		2	3				6	1	
Sleeves	1	16	6	11	11	29	3	5	24	12		12	130	17	9
Clamp Sleeves		3		2	7				6			14	15	17	7
Caps			2	2	4	3	3	3	8			9	6	5	
Reducers			1	3	2	7	9	4	35		43	31	53	18	
Bevel Hubs													6	3	
Curve Pipe		13		3	21	19		5	3			27	9	28	7
Quarter Turns				2	10	4	11	14	59	2		51	34	15	22
Double Hubs							3	6					13		
Offset Pipes									21			44	34	30	
Yoke Pipes									10			13	15	2	
Manhole Pipes			1		2										
One-eighth Turns			1		2	9	2	19	27	6		55	12	10	22
Pieces of Pipe	1	5	2	2	4	5	1		8	1	3	2	7	7	31
Blow-off and Manholes					1										
Plugs	1	2											2	6	
Thawing Clamps									33			17	26	37	
Straps			3	2											
Branch Openings			4		18	3									
Stopcocks			1	1	2	1	1	7	15			15	25	20	35
Manhole Branches					4										

Lowry Hydrants. — 52 Lowry hydrants, 5 barrels, 1 pot, 4 frames and covers, 2 square covers, 14 bottom extensions, 3 top extensions, 14 wastes, 77 rubber valves, 86 rubber rings, 24 iron valves, 10 chucks, 491 bolts, 322 nuts, 407 lbs. comp. castings, unfinished.

Post Hydrants. — 30 Post hydrants, 22 frames and covers, 19 valve pots, 1 pot, 2 rubber valves, 93 rubber rings, 54 lbs. composition castings.

Boston Hydrants. — 70 Boston hydrants, 50 frames and covers, 17 heavy frames and covers, 68 straps, 137 wastes, 18 bends, 7 frames, 10 valve-seats, 100 screws, 32 nuts.

Boston Y Hydrants. — 12 Y hydrants, 1 pot, 21 rubber valves, 18 frames and covers.

For Stopcocks. — 1 4-inch screw for waste wier, 1 do. for Brookline reservoir, 2 16-inch check valves, 8 12-inch valves, 18 8-inch valves, 18 8-inch screws, 130 8-inch rings, 18 8-inch stuffing-boxes, 6 $2\frac{1}{2}$ + 2-inch valves, 7 $2\frac{1}{2}$ -inch screws for goosenecks, 43 frames, 114 covers, 5 heavy frames and covers, 28 reservoir covers, 9 B. O. covers, 850 bolts, 356 malleable nuts, 10,477 lbs. iron castings, for 12, 8, 6, and 3-inch gates, 1,182 lbs. comp. castings for same.

Meters in Shop. — 1 3-inch, 8 2-inch, 5 1-inch, $45\frac{5}{8}$ -inch.

Stock for Meters. — 26 1-inch cocks and pipes for connections, $30\frac{1}{8}$ -inch do., $45\frac{5}{8}$ -inch clocks, 60 spindles, 42 rubber nipples, 40 glasses, 8 sheets strawboard, 2 2-inch connection pieces, 1 3-inch do., $6\frac{5}{8}$ -inch do., 6 4-inch and 10 3-inch fish boxes.

For Service Pipe. — 39 2-inch nipples, 38 2-inch nuts, 38 2-inch tubes, 9 $1\frac{1}{2}$ -inch union cocks, 9 $\frac{1}{2}$ -inch nuts and tubes, 19 $1\frac{1}{4}$ -inch union cocks, 45 $1\frac{1}{4}$ -inch tubes, 53 $1\frac{1}{4}$ -inch nuts, 38 $1\frac{1}{4}$ -inch male couplings, 114 1-inch union cocks, 5 1-inch air-cocks, 56 1-inch T cocks, 70 1-inch tubes, 83 1-inch nuts, 115 1-inch male couplings, 13 $\frac{3}{4}$ -inch union cocks, $37\frac{3}{4}$ -T cocks, 80 $\frac{3}{4}$ -inch tubes, 106 $\frac{3}{4}$ -inch nuts, 87 $\frac{3}{4}$ -inch male couplings, 177 $\frac{5}{8}$ -inch union cocks, 42 $\frac{5}{8}$ -inch crooked cocks, 36 $\frac{5}{8}$ -inch thawing cocks, 36 $\frac{5}{8}$ -inch T cocks, 24 $\frac{5}{8}$ -inch Y cocks, 76 $\frac{5}{8}$ -inch solder-cocks, 24 $\frac{5}{8}$ -inch right angle cocks, $41\frac{5}{8}$ -inch thawing couplings, 48 $\frac{5}{8}$ -inch male couplings, 460 $\frac{5}{8}$ -inch tubes, 289 $\frac{5}{8}$ -inch nuts, 53 $\frac{1}{2}$ -inch union cocks, 19 $\frac{1}{2}$ -inch crooked cocks, $22\frac{1}{2}$ -inch male couplings, 10 $\frac{1}{2}$ -inch nuts, 30 $\frac{1}{2}$ -inch tubes, 13 2-inch double headers, 26 flange-pipe for 1-inch cocks, 104 extension-tubes, 290 caps, 150 boxes, 138 T boxes (new), 24 T boxes, 22 Y boxes, 109 square boxes.

Lead Pipe. — 255 lbs. 3-inch lead pipe, 416 lbs. 2-inch lead pipe, 337 lbs. $1\frac{1}{2}$ -inch lead pipe, 858 lbs. $1\frac{1}{4}$ -inch lead pipe, 2,170 lbs. 1-inch lead pipe, 3,232 $\frac{3}{4}$ -inch lead pipe, 17,574 lbs. $\frac{5}{8}$ -inch lead pipe, 1,042 lbs. $\frac{1}{2}$ -inch lead-pipe, 376 lbs. 1-inch tin-lined pipe, 318 lbs. $\frac{5}{8}$ -inch tin-lined pipe, 74 lbs. $\frac{5}{8}$ -inch block-tin pipe, 30 lbs. banca tin, 60 lbs. solder.

Blacksmith's Shop. — 1,685 lbs. round iron, 2,935 lbs. flat iron, 824 lbs. cast steel, 68 lbs. spring steel, 56 lbs. shoes, 17 pick blanks, 4 tons Cumberland coal.

Carpenter's Shop. — 12 Lowry hydrant-boxes, 9 post do., 10 Boston do., 62 Lowry do., unfinished, 7 stopcock boxes,

18 do., unfinished, 8 meter boxes, 1,700 lbs. spikes and nails, 45,900 ft. 2-inch plank, 200 paving-blocks, 459 ft. spruce joist.

Tools. — 1 steam-engine, 1 large hoisting-crane, 3 boom derricks, 8 hand-geared do., 8 sets shears, and rigging for same, 8 tool-houses, 4 tool-boxes, 7 nozzles, 2 platform scales, 1 portable blacksmith shop, 1 portable cover for Brewer Fountain, 1 hand-roller, 2 horse do., tools for laying main and service pipes, 2 engine-lathes, 1 foot do., 1 hand do., 1 Pratt and Whitney do., 1 planer, 1 boring-mill, 1 chain hoisting gear, 1 upright drilling-machine, 4 grind-stones, 1 trip hammer, the necessary tools for carrying on the machine, blacksmith, carpenter, and plumbing shops, 1 circular-saw, 1 fan-blower, 1 40-inch proving-press, 1 36-inch do., 1 small do., 9 wheelbarrows, 3 handbarrows, also a lot of patterns at foundery where we obtain castings.

Stable. — 13 horses, 13 wagons, 2 buggies, 6 pungs, 1 sled, 2 sets runners, 2 carts, 17 sets harness, 30 blankets, 3 buffalo robes, 8 tons hay, 100 bushels grain, 1 jigger, 4 lap-ropes, 2 hay-cutters.

Beacon Hill Reservoir. — 1 large composition cylinder, 1 16-inch jet, 1 6-inch composition jet, 3 composition plates, 9 cast-iron plates, 2 4-inch composition jets, 5 swivel-pipe patterns, 1 2-inch copper straight jet, 6 composition jet for small fountains

Miscellaneous. — 30,332 lbs. pig lead, 1,646 lbs. gasket, 1 fountain basin, 1 stone trough for drinking-fountain, 80 cords wood, 1 thawing-boiler, 1 hose-carriage, 1 garden-pump, 65 3-inch earthen pipe, 1 12-inch earthen $\frac{1}{4}$ turn, 2 6-inch $\frac{1}{8}$ do., 95 lbs. sal. soda, 140 lbs. new rope, 1,000 paving-brick, 20 face-brick, 5 tons sand, 300 tons gravel, 22 gallons neat's-foot oil, 45 gallons kerosene-oil, 24 gallons linseed-oil, 30 lbs waste, 3 bbls. cement, lot of old bolts.

E. R. JONES.

Superintendent Eastern Division.

CIVIL ORGANIZATION OF THE WATER WORKS, FROM THEIR COMMENCEMENT, TO MAY 1, 1879.

WATER COMMISSIONERS.

NATHAN HALE, JAMES F. BALDWIN, THOMAS B. CURTIS. From May 4, 1846, to January 4, 1850.

ENGINEERS FOR CONSTRUCTION.

JOHN B. JERVIS, of New York, Consulting Engineer. From May, 1846, to November, 1848.

E. S. CHESBROUGH, Chief Engineer of the Western Division. From May, 1846 to January 4, 1850.

WILLIAM S. WHITWELL, Chief Engineer of the Eastern Division. From May, 1846, to January 4, 1850.

CITY ENGINEERS HAVING CHARGE OF THE WORKS.

E. S. CHESBROUGH, Engineer. From November 18, 1850, to October 1, 1855.

GEORGE H. BAILEY, Assistant Engineer. From January 27, 1851, to July 19, 1852.

H. S. MCKEAN, Assistant Engineer. From July 19, 1852, to October 1, 1855.

JAMES SLADE, Engineer. From October 1, 1855, to April 1, 1863.

N. HENRY CRAFTS, Assistant Engineer. From October 1, 1855, to April 1, 1863.

N. HENRY CRAFTS, City Engineer. From April 1, 1863, to November 25, 1872.

THOMAS W. DAVIS, Assistant Engineer. From April 1, 1863, to December 8, 1866.

HENRY M. WIGHTMAN, Resident Engineer at C. H. Reservoir. From February 14, 1866, to November, 1870.

JOSEPH P. DAVIS, City Engineer. From November 25, 1872, to present time.

A. FTELEY, Resident Engineer on construction of Sudbury-river works, from May 10, 1873, to present time.

After January 4, 1850, Messrs. E. S. CHESBROUGH, W. S. WHITWELL, and J. AVERY RICHARDS, were elected a Water Board, subject to the direction of a Joint Standing Committee of the City Council, by an ordinance passed December 31, 1849, which was limited to keep in force one year; and in 1851 the Cochituate Water Board was established.

COCHITUATE WATER BOARD.

Presidents of the Board.

THOMAS WETMORE, elected in 1851, and resigned April 7, 1856† Five years.

JOHN H. WILKINS, elected in 1856, and resigned June 5, 1860† Four years.

EBENEZER JOHNSON, elected in 1860, term expired April 3, 1865 Five years.

OTIS NORCROSS, elected in 1865, and resigned January 15, 1867 One year and nine months.

JOHN H. THORNDIKE, elected in 1867, term expired April 6, 1868	One year and three months.
NATHANIEL J. BRADLEE, elected April 6, 1868, and resigned January 4, 1871	Two years and nine months.
CHARLES H. ALLEN, elected January 4, 1871, to May 4, 1873.	Two years and four months.
JOHN A. HAVEN, elected May 4, 1873, to Dec. 17, 1874†	One year and seven months.
THOMAS GOGIN, elected Dec. 17, 1874, and resigned May 31, 1875	Six months.
L. MILES STANDISH, elected August 5, 1875, to July 31, 1876	One year.

Members of the Board.

THOMAS WETMORE, 1851, 52, 53, 54, and 55†	Five years.
JOHN H. WILKINS, 1851, 52, 53, *56, 57, 58, and 59†	Eight years.
HENRY B. ROGERS, 1851, 52, 53, *54, and 55	Five years.
JONATHAN PRESTON, 1851, 52, 53, and 56	Four years.
JAMES W. SEAVER, 1851†	One year.
SAMUEL A. ELIOT, 1851†	
JOHN T. HEARD, 1851	One year.
ADAM W. THAXTER, Jr., 1852, 53, 54, 55†	Four years.
SAMPSON REED, 1852 and 1853	Two years.
EZRA LINCOLN, 1852†	One year.
THOMAS SPRAGUE, 1853, 54, and 55†	Three years.
SAMUEL HATCH, 1854, 55, 56, 57, 58, and 61	Six years.
CHARLES STODDARD, 1854, 55, 56, and 57†	Four years.
WILLIAM WASHBURN, 1854 and 55	Two years.
TISDALE DRAKE, 1856, 57, 58, and 59†	Four years.
THOMAS P. RICH, 1856, 57, and 58†	Three years.
JOHN T. DINGLEY, 1856 and 59†	Two years.
JOSEPH SMITH, 1856†	Two months.
EBENEZER JOHNSON, 1857, 58, 59, 60, 61, 62, 63, and 64	Eight years.
SAMUEL HALL, 1857, 58, 59, 60, and 61†	Five years.
GEORGE P. FRENCH, 1859, 60, 61, 62, and 63	Five years.
EBENEZER ATKINS, 1859†	One year.
GEORGE DENNIE, 1860, 61, 62, 63, 64, and 65	Six years.
CLEMENT WILLS, 1860	One year.
G. E. PIERCE, 1860†	One year.
JABEZ FREDERICK, 1861, 62, and 63†	Three years.
GEORGE HINMAN, 1862 and 63	Two years.
JOHN F. PRAY, 1862	One year.
J. C. J. BROWN, 1862	One year.
JONAS FITCH, 1864, 65, and 66	Three years.
OTIS NORCROSS, *1865 and 66	Two years.
JOHN H. THORNDIKE, 1864, 65, 66, and 67†	Four years.
BENJAMIN F. STEVENS, 1866, 67, and 68	Three years.
WILLIAM S. HILLS, 1867	One year.
CHARLES R. TRAIN, 1868	One year.
JOSEPH M. WIGHTMAN, 1868 and 69	Two years.
BENJAMIN JAMES, *1858, 68, and 69	Three years.
FRANCIS A. OSBORN, 1869	One year.
WALTER E. HAWES, 1870†	One year.
JOHN O. POOR, 1870	One year.
HOLLIS R. GRAY, 1870	One year.
NATHANIEL J. BRADLEE, 1863, 64, 65, 66, 67, 68, 69, 70, and 71	Nine years.
GEORGE LEWIS, 1868, 69, 70, and 71	Four years.

SIDNEY SQUIRES, 1871	One year.
CHARLES H. HERSEY, 1872	One year.
CHARLES H. ALLEN, 1869, 70, 71, and 72	Four years.
ALEXANDER WADSWORTH, *1864, 65, 66, 67, 68, 69, and 72	Seven years.
CHARLES R. MCLEAN, 1867, 73, and 74	Three years.
EDWARD P. WILBUR, 1873 and 74	Two years.
JOHN A. HAVEN,, 1870, 71, 72, 73, and 74†	Five years.
THOMAS GOGIN, 1873, 74, and 75*	Three years.
AMOS L. NOYES, 1871, 72, and 75	Three years.
WILLIAM G. THACHER, 1873, 74, and 75	Three years.
CHARLES J. PRESCOTT, 1875	One year.
EDWARD A. WHITE, 1872, 73, 74, 75, and 76†	Five years.
LEONARD R. CUTTER, 1871, 72, 73, 74, 75, and 76†	Six years.
L. MILES STANDISH, 1860, 61, 63, 64, 65, 66, 67, 74, 75, and 76†	Ten years.
CHARLES E. POWERS, *1875 and 76†	Two years.
SOLOMON B. STEBBINS, 1876†	One year.
NAHUM M. MORRISON, 1876†	One year.
AUGUSTUS PARKER, 1876†	One year.

* Mr. John H. Wilkins resigned Nov. 15, 1855, and Charles Stoddard was elected to fill the vacancy. Mr. Henry B. Rogers resigned Oct. 22, 1865. Mr. Wilkins was re-elected Feb., 1856, and chosen President of the Board, which office he held until his resignation, June 5, 1860, when Mr. Ebenezer Johnson was elected President; and July 2, Mr. L. Miles Standish was elected to fill the vacancy occasioned by the resignation of Mr. Wilkins. Otis Norcross resigned Jan. 15, 1867, having been elected Mayor of the city. Benjamin James served one year, in 1858, and was reelected in 1868. Alexander Wadsworth served six years, 1864-69, and was reelected in 1872. Thomas Gogin resigned May 31, 1875. Charles E. Powers was elected July 15 to fill the vacancy occasioned by the resignation of Mr. Gogin.

† Served until the organization of the Boston Water Board.

‡ Deceased.

BOSTON WATER BOARD, *Organized July 31, 1876.*

TIMOTHY T. SAWYER, *Chairman*, from July 31, 1876.

LEONARD R. CUTTER, from July 31, 1876.

ALBERT STANWOOD, from July 31, 1876.

Clerk.

WALTER E. SWAN.

Superintendent of the Eastern Division of Cochituate Department.

EZEKIEL R. JONES.

Superintendent of the Western Division of Cochituate Department.

DESMOND FITZGERALD.

Superintendent of Mystic Department.

CHARLES H. BIGELOW.

Water Registrar of the Cochituate Department.

WILLIAM F. DAVIS.

Water Registrar of the Mystic Department.

JOSEPH H. CALDWELL.

City Engineer.

JOSEPH P. DAVIS.

Resident Engineer on Additional Supply.

A. FTELEY.



[April, 1879, 10,000.]

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